This Month We Examine: How Compatible Is "Compatible"?

MICROCOMPUTING®

WAYNE GREEN INC.

February 1984
USA $2.95
Number 86

A New Dimension In Micros

Can the 68000 Really Run Everything Under the Sun?

The Timex/Sinclair 2068— Promise and Potential

Talk of Tandy's 2000



(See p. 60)

Apple's Crisp, New Macintosh

0 74470 65945 02 A

Cardco Presents

16 Key Keypad for the VIC-20™ and Commodore 64™

The CARDKEY/1 provides an additional programable 16 keys to either the VIC or 64. This is a separate pad that plugs into the joystick port of your computer. It comes with tape programs (transferable to disk) that allow the user to define the 16 keys as any number, letter or character string value. It additionally allows the keys to be defined as strings. Another function available is the direct calculator mode in which you use your computer as a calculator. For example you press 5 + 5 (enter) and the computer prints 10 on the screen.



The CARDKEY features:

- 16 keys laid out in a calculator format
- All keys are user definable
- Keys can be defined as any character
- Keys can be defined as complete strings
- Optional calculator mode

Manufacturer's Suggested Price: $39.95

cardkey 1



See a complete line of American made Cardco Products at a computer store near you, today.

313 Mathewson • Wichita, Kansas 67214 • (316) 267-6525

Circle 369 on Reader Service card

VIC-20 & C-64 are registered trademarks of Commodore Business Systems, Inc.

cardco, inc.

Circle 361 on Reader Service card.

The new pacesetter in professional printers.

The economical dual-speed Radix-15 multi-function printer.

With a fast and furious work pace, a highly flexible printer is crucial. That printer is the new Radix-15. Watch it take your work and run with it.

It's dual speed! At 200 cps Radix fires out a superbly refined dot matrix printout. At 50 cps it prints professional near-letter quality. So now you can go from spreadsheets to memos at the flip of a switch or at your computer's command.

It's multi-functional! In either mode Radix-15 quickly adapts to your needs. There's serial and parallel interface. Memory storage with a 16K buffer. Responsive throughput to help you use time more efficiently. Bi-directional performance. Friction and tractor feed. An automatic sheet feeder for letterheads and a short form tear-off for preprinted forms. Plus, the freedom to underline, set vertical and horizontal tabs and print a huge variety of type faces.

It's economical! And not only does Radix give you 2 printers in 1, it also gives you a price performance as outstanding as its working performance.

The professional Radix-15. Using the ever-changing beat of business to your advantage. And that's what being a pacesetter is all about!

star MICRONICS, INC

THE POWER BEHIND THE PRINTED WORD.

Computer Peripherals Division
P.O. Box 612186, Dallas/Ft. Worth Airport, TX 75261 (214) 456-0952



Editorial Offices
80 Pine St.
Peterborough, NH 03458

MICROCOMPUTING

EDITORIAL DIRECTOR
WAYNE GREEN PUBLICATIONS
Jeff DeTray

EDITOR-IN-CHIEF
Keith Thompson

SENIOR EDITORS
Larry Canale, Dan Muse

ASSISTANT EDITORS
Tracy Mayor, Sheila Wright

TECHNICAL EDITOR
Jim Heid

EDITORIAL ADMINISTRATION
Jill Hall

EDITORIAL DESIGN MANAGER
Susan Gross

EDITORIAL DESIGNER
Joan Ahern

LAYOUT EDITORS
Phil Geraci, Maurelle Godoy, Sue Hays, Judy Oliver, Phyllis Pittet

PROOFREADER
Harold Bjornsen

ASSOCIATE EDITORS
Robert Baker, Thomas Bonoma, Frank Derfler, Jr., Mark Robillard

PRODUCTION DIRECTOR
Nancy Salmon

ADVERTISING PRODUCTION
Bruce Hedin

PRODUCTION DEPARTMENT
Lahri Bond, Cynthia Boucher, Patricia Bradley, Fiona Davies, Linda Drew, Michael Ford, Marjorie Gillies, Marlene Mowbry, Scott Philbrick, Paula Ramsey, Lynne Simonson, Ken Sutcliffe

FILM PRODUCTION
Theresa Verville, Donna Hartwell, Laurie Jennison, Robert Villeneuve

PHOTOGRAPHY
Thomas Villeneuve, Sandra Dukette, Laurie Gardos, Nathaniel Haynes, Sturdy Thomas

TYPESETTING
Sara Bedell, Manager; Darlene Bailey, Marie Barker, Prem Krishna Gongaju, Lynn Haines, Cynthia Letourneau, Kimberly Nadeau, Debra Nutting, Lindy Palmisano, Heidi N. Thomas, Sue Weller

CREATIVE CONSULTANT
Christine Destrempes

DESIGN MANAGER
Joyce Pillarella

DESIGN CONSULTANT
Howard Happ

ADMINISTRATIVE ASSISTANTS
Sue Donohoe
January Folsom
Patrice Scribner

DESIGN ASSISTANT
Sarah Werninger

CHIEF COPY WRITER
Steve Tripp

COPY WRITER
Dale Tietjen

THE COLUMNISTS

6 Publisher's Remarks
By Wayne Green
Publisher Prepares Tech College

12 The Edit Mode
Looking at Las Vegas' Comdex

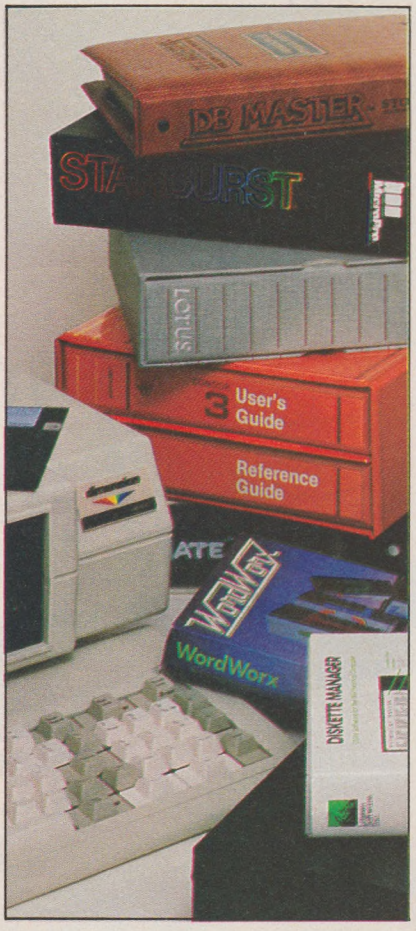
16 Overview
By Frank J. Derfler, Jr.
Hot New Micros from IBM, Tandy

22 What's New, Big Blue?
By Thomas Bonoma
Solving a pfs Mystery

28 Techniques
By Mark J. Robillard
On the Designing of Micros

32 PET-pourri
By Robert Baker
Easy Script Word-Counting

New dimension in compatibility. Page 66.



COVER: Compatibility

36 Kaypro Joins the PC Crowd
Given the vast selection of IBM software, it would make sense for Kaypro II and 4 owners to try and dip into that field. This article shows how you can have IBM software running on your Kaypro.
By Thomas Howe

66 Dimension 68000: The Epitome Of Compatibility?
Micro Craft has taken the furthest step in bridging the compatibility gap; the Dimension 68000 can emulate IBM, Apple, TRS-80, Osborne, Kaypro and just about everything else. By Jim Heid

82 What Do You Mean "Compatible"?
The author talks to several industry managers in providing this mini-course in compatibility.
By Rick Cook

Good things in small packages. Page 76.



ARTICLES

42 CP/M of a Different Color
With the help of this program, you can select border, screen and character colors in CP/M—on your C-64. It's normally impossible because Commodore's Z80 add-on microprocessor cartridge doesn't support changing colors after a CP/M disk is loaded. By Jeffrey Miles

46 Amazing Game, How Sweet the Sound
The magical game of mazes, Adventure, isn't really sweet-sounding, but it's one of the most popular computer pastimes around.
By Dafydd Dyar

Volume VIII No. 2
Contents: February 1984

52 You Ain't Writin' Too Good?
If your writing style isn't what you think it should be, you'll want to pick up Oasis Systems' Punctuation & Style, a program that's capable of catching your grammatical and spelling mistakes. By Thomas Howe

56 GP-7 Grafbar: A New Deal in Digitizers
Science Accessories' GP-7 Grafbar is not only simple to implement, but it offers compatibility with serial RS-232C interfaces.
By K. David Steidley

60 Apple's Back with the Mac
In this preview of the Macintosh, *Microcomputing* offers some insight into Apple's latest. Its release into the market could cause a Mac attack among micro buyers.
By Keith Thompson

64 Give the Osborne A Break (Key)
You can improve your Osborne's value with Image Sales' Osbreak; it provides a break key and an inexpensive way to use the Osborne 1's modem port. By Tim R. Norton

76 Timex's "Timely" Upgrade
All right, so Timex/Sinclair took seven months after it announced the T/S 2068 to actually release the machine. It was worth the wait—the 2068 offers color, a new keyboard style and layout and a $199.95 price tag.
By Sharon Zardetto Aker

86 The Waiting Is Over
You no longer are forced to take a coffee break while your system is printing a lengthy file. Practical Peripherals' Microbuffer dumps data to your printer so quickly that you're back to the keyboard in no time. By John Fail

88 The Good, the CAD And the Apple
Part 2 of the author's computer-aided-design tutorial shows what happens when you interface Logo to Houston Instrument's HiPlot Plotter Model DMP-4.
By Richard Fritzson

98 A Utility You Can't Refuse
The author presents a utility program, Document, that analyzes your Microsoft Basic program and prints a detailed report of its variables. By Steve Auyer

106 Smarter Than the Average Atari
In part 1 of a two-part article, the author explains how he made his Atari 400 an intelligent graphics interface.
By Brian and Christine Ence.

DEPARTMENTS

8 Letters to the Editor

116 Micro Software Digest
Software Reviews at a Glance

118 Book Reviews
Reviews of New Releases
On CP/M Software, VisiCalc, Communications and Assembly Language

124 Calendar
Softcon, Computer Expo '84
Coming Up

125 Dealer Directory

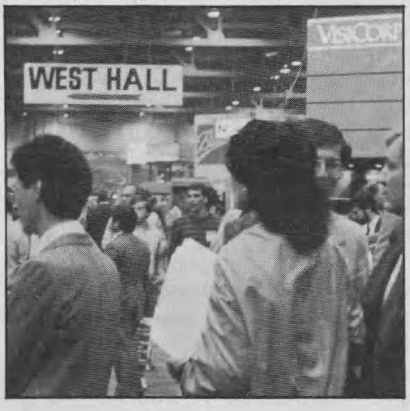
125 Classifieds

128 New Software

134 New Products

146 Software Reviews
Disk O'Utilities Fever
Getting a Feel for Footnote and Pair
Giving Access to Access Manager
Make Your Tax Time Easier

Cruising through Comdex. Page 12.



PRESIDENT/PUBLISHER/EDITOR
Wayne Green

VICE PRESIDENT/GENERAL MANAGER
Debra Wetherbee

VICE-PRESIDENT/FINANCE
Roger Murphy

ASSISTANT TO THE PRESIDENT/VP
Matthew Smith

ASSISTANT TO THE VP/FINANCE
Dominique Smith

DIRECTOR OF MARKETING & SALES
David Schissler

DIRECTOR OF ADVERTISING
Stephen Twombly

CIRCULATION DIRECTOR
William Howard
603-924-9471

RETAIL AND NEWSSTAND SALES MANAGER
Ginnie Boudrieau
1-800-343-0728

ADVERTISING
603-924-7138
Stephen Robbins, Jim Shaw, Linda McConnell

PUBLIC RELATIONS
Jim Leonard

Cover design by Howard Happ.

Cover photo by Frank Cordelle.

Microcomputing (ISSN 0744-4567) is published monthly by Wayne Green, Inc., 80 Pine St., Peterborough NH 03458. U.S. subscription rates $25, one year; $53, three years. Canada and Mexico $27.97, one year, U.S. funds. Foreign $44.97, one year; U.S. funds drawn on U.S. bank. Foreign air mail subscriptions—please inquire. Nationally Distributed by International Circulation Distributors. Second-class postage paid at Peterborough, NH 03458 and at additional mailing offices. Phone: 603-924-9471.

Entire contents copyright 1983 by Wayne Green, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

Postmaster: Send form #3579 to *Microcomputing*, Subscription Services, PO Box 997, Farmingdale, NY 11737.

Microcomputing is certified by the Audit Bureau of Circulations.

Microcomputing is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 42 computer publications in 18 major countries. Nine million people read one or more of the group's publications each month. Members of the publication group include: Australia: *Australasian Computerworld, Micro Magazine*; Argentina: *Computerworld/Argentina*; Brazil: *DataNews, MicroMundo*; Denmark: *Computerworld/Danmark, MikroData*; France: *Le Monde Informatique*; Germany: *ComputerWoche, MicroComputerWelt, PC Welt*; Italy: *Computerworld Italia*; Japan: *Computerworld Japan*; Mexico: *Computerworld/Mexico*; Norway: *Computerworld Norge, MikroData*; People's Republic of China: *China Computerworld*; Saudi Arabia: *Saudi Computerworld*; Spain: *Computerworld/Espana, MicroSistemas*; Sweden: *Computer-Sweden, MikroDatorn, Min Hemdator*; United Kingdom: *Computer Management, Computer Business Europe*; United States: *Computerworld, HOT CoCo, inCider, InfoWorld, ISO World, Microcomputing, PC World, 80 Micro, RUN*.

By Wayne Green

Calling All Whiz Kids

You Thought The Army Was Tough?

If you have a youngster 14–16 years old, you may be interested in what I have afoot. And if you are, I sure would like to hear from you.

Kids in this age group tend to be interested in high-tech hobbies, such as computers and amateur radio. It's mostly computers these days, because few kids are exposed to amateur radio. I'm trying to do something about that, but it's going to be a long, hard fight.

With the world being in the beginnings of the electronic revolution, you could do worse than get your kids interested in high-tech hobbies. This will, in most cases, take them into high-tech careers, which is where the money is and where it is going to be.

One of the problems you face if you do manage to infect your kid with high-tech fever will be when he or she reaches age 17—college. Good luck on finding a college that will be any of serious value toward helping your kid take advantage of his interest.

Enter the College Of the Future

Enter Wayne Green Business Technical College—possibly the answer to your prayers. I hope so, and I want to hear from you about it. Settle back while I tell you just what I have in mind. Put on your seat belt, this could be exciting.

My college, which I hope to have going in 1984 (more about that later), will be geared to the interests of the teenage high-tech hobbyist. There is considerable argument about the merits of a business education—going right out of high school and into business and learning that way—or going the more formal education route of college. A growing number of colleges mix the two, often in six-month or one-year lumps. Mine will mix, but on an even more intimate basis: half of every day will be spent at work with an on-campus business doing practical professional work.

That's right, every student will come out of my college with a resume showing a wide variety of work experience—plus an unusual technical and business training in the school to boot.

Before I tell you about the courses I'll be giving, let me explain my educational concept, which is different. It's evolutionary, not revolutionary, and it's drawn from my own personal experience.

You see, when I graduated from high school I went on to college because that is what a kid was supposed to do. In 1940, this concept wasn't even challengeable. I'd been planning on going to Dartmouth and perhaps getting into law, but my high school had some career guidance professionals to help us. They tested me and, astounded at my mechanical aptitude, insisted that I go to an engineering school instead. They pointed to my interest in amatuer radio, suggesting I take electrical engineering. I did and hated it.

World War II emptied out most of the colleges. Older people are too smart to go out and get killed, so they have the kids do it. I was 20 years old when I served aboard a submarine, and I was one of the older people on the boat!

The good part was the incredible electronics course the Navy had. In nine months, it turned kids who didn't know the difference between an ohm and a volt into technicians who could walk up to anything electronic and fix it. The school was fantastic and it was fun.

What was the difference between the Navy school and college? The Navy course followed up every theory lecture (chalk and talk) with a lab where I was able to get my hands on the equipment and work with it. Well, that's exactly what I'm going to do with my college. I'm hoping to have roughly two-thirds of the students' college time spent with lab work. None of this study, memorize and be tested bunk that I went through in my own college "education." What a waste of time!



The courses in my school are going to be about two-thirds technical and one-third business. This way the graduate will be equipped to either start a business or else be a darned good manager or executive in a going business. I feel that the strength of our country is dependent upon entrepreneurs, so I want to generate thousands of them.

The business courses I have in mind will cover just about everything I have found of value in business. Things like speed reading, writing, public speaking, dressing for success, personnel management, advertising, salesmanship, accounting, banking, taxes, insurance, going public, purchasing, graphic arts, printing, photography, marketing, data processing, management, office equipment, business law, importing and exporting, quality con-

trol, direct mail, testing and so on.

On the technical side, we'll start with electricity, and go on to motors and generators, electronic circuits, radio, digital, tubes, transistors, microprocessors, computer design, microwaves, satellite communications, television, video recording, the software languages, operating systems, compilers, utilities and so on.

By working the students hard—very hard—I am planning on being able to graduate them with a business/technical bachelor degree in a little more than two years. This means that the cost of the education is going to be much less than a four-year program. And instead of having to go to college until 21 or 22, our students will be graduating at around 19 and will already be seasoned workers by that time with more than two years of experience in on-campus businesses.

Get Paid, Too

Further, since the students will be working at these businesses for pay, they should be able to cover a good percentage of their college costs right there. I said they would work hard. To me that means five hours a day, six days a week, 50 weeks a year (like the rest of us). That's 30 hours a week of work at a pay rate of about $4 per hour or $6000 a year.

The pay for the work will help toward tuition, but will be insignificant to the value of the experience. I intend to entice high-tech businesses to come on campus to provide employment for these students—to help with research and development, production, quality control, sales, marketing, accounting and just about every other job at these firms. The students will be rotated around to different jobs every few months so they'll get a wide variety of experience. This will help them understand how businesses work and ease their entry into business later.

Such a schedule means no soccer team, no beer busts, no junior prom. It may be tough on some students, but there will also be no smoking. There won't be the usual three-month summer vacation, just a couple weeks at Christmas and then back at it again hot and heavy. It is going to be the hardest work your kids have ever done, but I think they are going to love it.

I've been working 100-hour work weeks for years, so I think that asking for a 60-hour week isn't going to destroy anyone. I expect that this rugged schedule will have several benefits. It will turn out graduates who won't know what a 40-hour work week is and will just naturally move right ahead of anyone else they work with who is geared to the old mini-work week. Further, if they do start their own business, they are going to have to go to a 100-hour week schedule anyway, so it won't surprise them. And then think of the benefit to the on-campus businesses that are running 60-hours a week. They'll quickly outpace competitors.

One of the reasons I'm looking for hobbyist-oriented students is that I want kids that are so involved with what they are doing and learning that they won't even notice what long hours they are putting in. They will work hard and have the time of their lives.

Here's the Pitch

Is this a college that you would like your kids to attend? Do you think they could hack the schedule? I need to get an idea of how many students I've got to gear up to handle. I haven't the slightest idea of whether there are a hundred, a thousand . . . who would like to get educated for success, complete with the business and technical training needed.

A regular four-year college education costs around $50,000 these days. With my system, I think I can cut that to much less than half of that—probably under $20,000 for the whole works.

If you think one or more of your children might be interested, talk it over with them and let me know. As desperate as the need for this type of graduate is—and I think they may be able to name their price as employees—a lot of kids are geared more toward colleges where they don't have to work much, have lots of social life, a steady string of liberal arts courses, pot, beer, cruising, fraternities and so on. I don't know much to do about that other than frustrate over the waste.

The Next Wave

We're well into the electronic revolution, as I said. This means that the best jobs these days are in electronics, communications and computers. Right now computers are the big thing, the wave of growth. But just as soon as this wave starts to ease off, we're going to be into the next big wave: communications. You see, all of our computers are going to have to be able to communicate with each other and this is going to create an enormous industry, with satellites, fiber optics, cables and microwaves. Our kids should be ready to both help this happen and take advantage of it.

I'm not having any problem finding a college campus interested in working with me on the plan. I've talked with quite a few college presidents and found them enthusiastic. We're trying to decide which campus will best suit our needs. It will be one in the northern part of New England, probably in New Hampshire. Costs are low here and there is plenty of land available for associated businesses to locate. The quality of life here in New Hampshire is difficult to beat anywhere, which is probably why it is one of the fastest growing states.

So, if you have a youngster of college age coming along in a year or two who might be interested, please drop a note to Wayne Green, Technical Institute, 80 Pine St., Peterborough, NH 03458. No obligation, of course.□

Circle 170 on Reader Service card.

CHIPS & DALE

4116 200 ns 8/$12.00 100 + $1.18 ea.
4116 150 ns 8/$13.75 100 + $1.25 ea.
2114L 300 ns 8/$12.00
2114L 200 ns 8/$13.00
4164 200 ns $5.50 ea 100 + CALL
4164 150 ns $5.95 ea 100 + CALL
6116 150 ns $5.20 ea 100 + CALL
6116 200 ns $4.85 ea 100 + CALL
6116 LP 150 $5.85
1791 Disk Controller $20.00
1771 Disk Controller $16.75
Z80A CPU $3.50
Z80A CTC $3.50
Z80A PIO $4.00
8251A $4.00 ea
8255 $4.25
2716-1 (5V) 350 ns 8/$4.25 ea $5.00 ea
2716 (5V) 450 ns $3.35 ea 100 + CALL
2732 $3.85 ea 100 + CALL
2532 8/$4.25 $5.00 ea 100 + CALL
2764 5V 300 ns 28 pin $5.95 ea
2564 $16.50
68000 CPU $CALL
8087 Intel Co-processor for 8088 CALL

COMPUTERS

NEC APC Computers	CALL	CALL
Altos Computers	CALL	CALL
Sage II (16 bit)	CALL	CALL
IBM P.C. complete sys. (with or w/out hard disk)	CALL	CALL

IBM PERIPHERALS

Baby Blue board	CALL	CALL
Quadram board & Quadram II	$275.00	CALL
Davong hard-disk	CALL	CALL
Davong board	CALL	CALL
Amdek Monitors	CALL	CALL
Princeton Monitors	$700.00	CALL
NEC 3550 Printer	$2,297.	CALL
Call for other IBM Peripherals		
NEC Printer P.C. 8023	$695.00	$465.00
Other NEC Printers	—	CALL
Okidata Printers		
82A	$748.00	CALL
83A	$995.00	CALL
84A	$1395.00	CALL

DISK DRIVES

Tandon 100-2 320K $240.00
Shugart Drives SA-455-2 ½ height 320K . $235.00
PANASONIC ½ height DSDD 320K $235.00
Control Data Drives $249.00

WE REPAIR & FIX DRIVES

Allow up to 3 wks. for personal checks to clear. Please include phone number. Price subject to change without notice. Shipping & Handling for Chips $3.50. FOB Bellevue, WA for all else. Wash. residents add 7.9% Sales Tax.

CHIPS & DALE
10655 N.E. 4th St., Suite 400
Bellevue, WA 98004
1-206-451-9770

LETTERS TO THE EDITOR

Unsuitable for Graphics

Thanks for publishing Clifford Engels' article "Atari Joystick/Printer Connection," (*Microcomputing*, August 1983, p. 80). Unfortunately, his design didn't provide eight-bit data output, so it wasn't usable for printing graphics. To further complicate matters, Atari didn't provide access to any of the 6520 PIA handshake lines.

My approach for this fix was to implement the full eight-bit data interface without any changes to the computer; an additional cable connector and wire; 23 bytes of code completes this modification. I made code changes and additions to Engels' Listing 2 in lines 32240, 32250, 32270 to 32290, 32310 to 32340, 32380, 32400, 32420, 32430; the necessary cabling information and the Basic program is in Listing 1.

To use this printer driver, load and run the program; the operating system can utilize it to print whenever an LPRINT or L."P" (lists a program) is used. One caution: since this program resides in page 6 in machine code form, other programs utilizing page 6 may clobber this driver (Monkey Wrench, for one, uses page 6).

Harley Shanko
Van Nuys, CA

Reply:

Mr. Shanko has implemented the high-order bit of the data bus the way I implied it could be done in my article.

The reason I didn't originally follow this implementation was that my printer doesn't have graphics capability or use the high-order bit in any way. Furthermore, I leave the printer permanently connected to the Atari and my children would have disowned me if I had taken up another one of their joystick ports for my printer. If I had needed the high-order bit of the data bus to run my printer and been able to persuade my children to give up another joystick port, I would have implemented it exactly as Mr. Shanko has done.

Clifford Engels
Fremont, CA

```
32000 REM Direct Atari-Printer Driver for text and graphics without an 850.
32010 REM .  -adapted by Harley Shanko, 27 Oct 83, from Clifford Engels'
32030 REM article in Microcomputing, Aug 83, pgs 80-85. This design uses
32050 REM game controller jacks J3 and J4 for data output, busy input and
32060 REM J2 for printer strobe. Connectors are DB-9 type; the wire table
32070 REM is for 'Centronic' compatible printer (Epson MX-80, etc) cabling:
32090 REM .           Atari-conn/pin  Printer-pin/signal
32100 REM .               J2-4          1 Strobe, active low
32105 REM .                 -8          *
32110 REM .               J3-1          2 Data 0
32115 REM .                 -2          3   "  1
32120 REM .                 -3          4   "  2
32125 REM .                 -4          5   "  3
32130 REM .                 -8          *
32135 REM .               J4-1          6   "  4
32140 REM .                 -2          7   "  5
32145 REM .                 -3          8   "  6
32150 REM .                 -4          9 Data 7
32155 REM .                 -6         11 Busy, active low
32160 REM .                 -8          *
32170 REM .   * Printer pins 16,17,19-30 (ground and signal returns) should
32180 REM . be wired together and cabled to J2,J3,J4 pin 8.
32190 REM . Always cable equipment together prior to plugging into AC mains.
32200 ST=1536:RESTORE 32240
32210 READ A:IF A=999 THEN 32230
32220 POKE ST,A:ST=ST+1:GOTO 32210
32230 A=USR(1540):END
32240 DATA 32,181,6,0,76,180,6,29,6,176
32250 DATA 6,176,6,77,6,176,6,176,6,76
32260 DATA 120,238,0,0,0,0
32261 DATA 1
32262 REM -LINE SPACE CNT (POKE 1562)
32263 DATA 80
32264 REM -CHAR CNT (POKE 1563)
32265 DATA 60
32266 REM -TEXT CNT (POKE 1564)
32267 DATA 6
32268 REM -OVERFLOW CNT (POKE 1565)
32270 DATA 169,56,141,2,211,169,48,141,3,211,169,128,141,0,211,169,255,141,1,211
32280 DATA 169,60,141,2,211,169,52,141,3,211,169,128,141,0,211,169,128,141,1,211
32290 DATA 173,28,6,141,25,6,208,87,201,155
32300 DATA 208,2,169,13,172,19,208,208,251,168
32310 DATA 141,1,211,9,128,141,0,211,41,127,8,120,141
32320 DATA 0,211,162,10,202,208,253,169,128,141
32330 DATA 0,211,40,152,201,13,240,29,201,10
32340 DATA 240,7,206,24,6,240,208,208,45,174
32350 DATA 25,6,208,13,173,29,6,141,23,6
32360 DATA 24,109,28,6,141,25,6,174,23,6
32370 DATA 240,10,206,23,6,206,25,6,169,10
32380 DATA 208,175,173,27,6,141,24,6,173,26
32390 DATA 6,141,23,6,160,1,96
32394 REM -DOS INIT AND SYS RESET
32396 DATA 104,165,12
32400 DATA 141,214,6,165,13,141,215,6,169,210
32410 DATA 133,12,169,6,133,13,169,7,141,27
32420 DATA 3,169,6,141,28,3,96,32,199,6
32430 DATA 76,213,6,999
```

Listing 1. Changes and additions to Clifford Engels' "Atari Joystic/Printer Connection" program listing.

Don't Buy JRT/Blue Earth

I'm writing to elicit your assistance, or at least to make you aware of problems in doing business with one of your advertisers, JRT Systems/Blue Earth. There is apparently something wrong with this company.

There are at least several dozen JRT Systems customers who never received JRT Pascal version 3.0, but paid money for it. To date, I have never received a response to my letters nor a satisfactory response to my two phone calls this summer seeking to get my copy, which I paid for in March. Each call resulted in an acknowledgement that the company had my order but were two to three weeks behind in their orders. Now, no response at all.

Then, Blue Earth has a full page ad on p. 47 announcing version 4.0 of JRT Pascal, saying it is the exclusive distributor.

I hope you look into this latest offer and can give some assurance to the user community that Blue Earth has a better business reputation than the previous marketers—JRT Systems; or, as many of us suspect, are they the same group under a



PALANTIR™ WORD PROCESSING

WE DON'T HAVE TO BEEF UP OUR GUARANTEE WITH A LOT OF BULL

Other software companies give you disclaimers. Palantir gives you a real guarantee: Palantir backs its software with 90 days of free phone support via a toll-free number. When you call, we won't tell you to ask your dealer or read your manual; we'll answer your question, free of charge. If we can't solve your problem, we'll replace your Palantir Software with any competitive software of comparable value.

We couldn't make an offer like this if we weren't confident about Palantir word processing. It's easy to learn, easy to use, easy to live with.

Palantir word-processing software is designed for microcomputers. Yet it gives you all the features of a dedicated word processor. You won't find a better system on the market today.

To find out more about Palantir software, call toll-free: 1-800-368-3797. In Texas, call 713-520-8221.

We'll respond with detailed information on Palantir software and a free "No Bull" button. A closer look will convince you that we're not just one of the herd. And that's no *bull*.

Circle 263 on Reader Service card.

Palantir Software 3400 Montrose Blvd. Suite 718 Houston, Texas 77006

™ Palantir is a trademark of Palantir, Inc.

different nameset. Although I recognize you can't be responsible for your advertisers I do think you would not want to allow questionable advertisers in your publication.

Any assistance you can lend will be greatly appreciated. As always, I enjoy your publication and was particularly happy to see the two excellent Heathkit articles by Martin Moore. Keep up the good work.

Gary L. Swallow
Sterling, VA

Dear Mr. Swallow,

Your letter is one of many we have received concerning JRT Systems. We have made numerous attempts to contact the company, but it refuses to reply. We have dropped them as advertisers and will continue to attempt to resolve the situation. Naturally, we encourage readers who have ordered products from JRT Systems (Blue Earth) to continue their efforts to be refunded. And if you haven't dealt with JRT or Blue Earth, don't! We will keep you abreast of any developments. If anyone has more information, let us know.

Editors

A New Dimension

Let's see a thorough review of the Dimension 68000 computer that was pictured on the inside front cover of your September *Microcomputing*. This may be the hobbyist machine of the future.

While hundreds of companies are dumping Z80 systems onto the market (cheap boards and software), and while dozens are producing IBM PC "clones," different name? Although I realize that you can't be responsible for your advertisers I do think you would not want to allow questionable advertisers in your publication.

Nils J. Dahl
Wethersfield, CT

Reply:

We're a step ahead of you. See P. 66 for the industry's first glimpse of the Dimension 68000 computer.

Editors

An Information Exchange

The Philippines' Computer Industry is still very much in its infancy. Most of our programming and computer personnel are still highly individualistic. We have deduced this to stem from the fact that we don't have an avenue by which we can exchange information.

So three months ago a group of five people decided to form a user's group that will cater to the software and hardware needs of the industry. We decided that a strong information base is needed and we strive to move in that direction.

In this respect, we believed it would be beneficial to contact similar user's groups in your country. It is our hope that in forming a correspondence with them we can learn more about these powerful tools.

Our exchange will include anything of interest to computer enthusiasts, particularly utilities and applications.

Through your magazine and the user's group, we hope to open up new horizons in computer trends.

We are eagerly awaiting your readers' replies. Thank you.

Mario Franco Arroyo
Public Relations Officer
14-D La Salle St.
Cubao, Quezon City
Philippines

Guarding Against Copy Cats

I'm in search of a program that can create "uncopyable copies" of programs.

I have a number of commercially available programs, none of which are copy-protected. I want to loan copies of those programs to others, but I don't want them to be able to make their own copies.

The people receiving the programs aren't computer hackers, so just defeating the ordinary PIP or Copy programs would be adequate.

There are some constraints. I cannot modify the original program, nor can I modify the user's operating system. And, obviously, the copy that I loan must be able to execute correctly. Are there any programs on the market that can do this? I am interested in versions for all the popular micros: Apple, Atari, Commodore, IBM PC. . . .

Allan D. Pratt
Graduate Library School
College of Education
University of Arizona
Tucson, AZ 85721

PC Mates?

I recently saw the following ad on Buy-Phone, Los Angeles' "Computerized Yellow Pages":

> ROOMMATE WANTED: I am looking for a roommate to share a two bedroom apartment in San Gabriel, CA. Rent is $225/month . . . You also may have partial use of my IBM PC computer . . .

Is Los Angeles setting a trend toward "Room and Baud"?

William Lappen
Los Angeles, CA

Aching for Information

I would like to address any readers out there in *Microcomputing* land who have experience with or knowledge about dental software programs.

I am currently using PAS-3 from Artificial Intelligence and would like to know if there is anything better out there.

It would be both fun and, in the long run, profitable to get and stay in touch with such readers and users. We would all be well-advised to establish a user's group in which to exchange ideas and experiences.

Computers are my bag and dentistry pays the bills. If you're interested or have anything to contribute, please write.

Dr. J.D. Smith Jr. B.S., D.D.S.
2950 Maryland Pkwy S Suite 6
Las Vegas, NV 89109

Dr. Smith,

We hope you get a rousing response. In the meantime, keep smiling.

Editors

It's a Long Way Down

Your comments in the December issue of *Microcomputing* (Publisher's Remarks, p. 6) show a narrow perception of the problems presented by the use of computers on airliners. I am also a pilot and a professional electronic engineer. I think these two areas give me insight into the problems presented.

The problem arises from the computer's use of square waves for timing information transfer and probably from a switching power supply. A square wave is the sum of all the odd (first, third, fifth, . . .) harmonics of the basic frequency. The odd harmonics cause interference.

The idea of holding the computer against the equipment is nice, but a real test would be to hold it against the antenna. But then one computer is not much of a test. How about 100 computers of various brands and models so the frequencies they emit can all beat against each other, adding the sums and differences to the background. Then knock the incoming nav signal down about the threshold of the receiver because the plane may be in a bad snowstorm and way out from the VOR.

Why 100? It's a nice round number, but then a 747 can hold 500 people. Also, you assume that all the computers are operating within spec. And don't count on the antennas being mounted where you'd expect them.

What I'm getting at, Mr. Green, is that I think you're out of line about your remarks concerning Eastern Airlines. The fact is that an airliner did crash because of a radiation emitting device back in the 1950s, so it is known as a possibility and shouldn't be ignored just for convenience. Hats off to Eastern for recognizing the *potential* danger.

Richard E. Hartman
South Gate, CA



The arcade classics. Now playing on home computers everywhere.

If you own a Commodore VIC 20 or 64, a Texas Instruments 99/4A, an IBM or Apple II, we've got what you've been waiting for!

The biggest arcade hits ever, the classics. DONKEY KONG by Nintendo, CENTIPEDE,™ PAC-MAN, DEFENDER, ROBOTRON: 2084, STARGATE and DIG DUG. (On the TI 99/4A you can also play Protector II, Shamus, Picnic Paranoia and Super Storm.)

And the hits will keep on coming. Soon you'll be able to play JOUST,™ JUNGLE HUNT,™ MOON PATROL,™ POLE POSITION,™ MS. PAC-MAN™ plus others on your home computer. Some games also available on Colecovision and Intellivision.

The Arcade Classics from ATARISOFT.™ They could be playing where you live. Today.

ATARISOFT™

Now your computer fits the arcade hits.



Circle 58 on Reader Service card.

DONKEY KONG and NINTENDO are trademarks and © Nintendo 1981, 1983. DEFENDER is a trademark and © Williams 1980, manufactured under license from Williams Electronics, Inc. ROBOTRON: 2084, MOON PATROL and JOUST are trademarks and © of Williams 1982, manufactured under license from Williams Electronics, Inc. DIG DUG is created and designed by Namco, Ltd. manufactured under license by Atari, Inc. Trademark and © Namco 1982. PROTECTOR II, SHAMUS and PICNIC PARANOIA are trademarks of Synapse Software Corporation, manufactured under license by Atari, Inc. SUPER STORM is engineered and designed by Synapse Software Corporation, manufactured under license by Atari, Inc. JUNGLE HUNT is a trademark and © of Taito America Corp. 1982. POLE POSITION is engineered and designed by Namco Ltd. manufactured under license by Atari, Inc. Trademark and © Namco. STARGATE is a trademark and © Williams 1981, manufactured under license from Williams Electronics, Inc. MS. PAC-MAN, PAC-MAN and characters are trademarks of Bally Midway Mfg. Co. sublicensed to Atari, Inc. by Namco-America, Inc. ATARISOFT™ products are manufactured by Atari, Inc. for use on the above referenced machines and are not made, licensed or approved by the manufacturers of these machines. COMMODORE 64, VIC 20, TEXAS INSTRUMENTS 99/4A, IBM, APPLE, COLECOVISION and INTELLIVISION are respectively trademarks of Commodore Electronics Limited, Texas Instruments, International Business Machines Corp., Apple Computer, Inc., Coleco Industries, Inc. and Mattel, Inc. A ♥ Warner Communications Company. © 1983 Atari, Inc. All rights reserved.

By Dan Muse

Comments On Comdex

Tandy Launches a Winner with Its Model 2000

Comdex is the who's-who event of the microcomputer field, and this year's show was as fashionable as ever. The great and even the not-so-great were in attendance at the autumn ritual in Las Vegas.

This year's Comdex featured few earth-shaking announcements. Windowing software got a lot of attention, and the incessant flood of IBM compatibles raged on.

The first day of the show featured the customary keynote addresses; the speakers were Jack Scanlon, vice-president of the Processor and Software Systems Division of Western Electric Co., and Bill Gates, chairman of Microsoft.

More interesting than the addresses was the introduction of the speakers by Sheldon G. Adelson, president of The Interface Group (sponsor of Comdex).

No Need to Panic

Adelson discussed the rumors of an industry shakeout. "The industry is alive and well and living at Comdex," Adelson assured the standing-room-only audience. He added that rumors of an industry shakeout are greatly exaggerated. Citing the show's 1400 exhibitors as proof, Adelson swept away all of "the negative headlines." Somehow methinks the sponsor doth protest too much.

The biggest story of the show was the Tandy announcement of its Model 2000 computer. Featuring MS DOS and limited



The Tandy 2000—MS DOS and more.



John V. Roach, chairman of the board, chief executive officer and president of Tandy Corp., was present to show off the Model 2000.

TRI-WRITER. It's a printer, a terminal and a typewriter.



YOU GET ALL THREE FOR LESS THAN THE PRICE OF ONE.

Only the new TRI-WRITER has the functions of three separate machines built into one easily transported unit. It's one tough machine that maintains constant and dependable operation under the most demanding conditions.



TRI-WRITER is a letter quality computer printer that's ruggedly designed to handle the huge amount of use a printer receives.

IT'S A DAISY WHEEL PRINTER This quiet, compact printer is ideal for businessmen, professionals and a host of others who require top quality letters and reports. Imagine how it could make your life easier and more productive.



IT'S A PORTABLE TERMINAL TRI-WRITER is a portable computer terminal with "hand-shake" capabilities.

Just plug it into any standard telephone modem and you communicate with everything from the huge public data banks to an office computer or even other TRI-WRITERS.

TRI-WRITER can give you portable access to up-to-the-minute stock market prices, business and economic news, information management assistance, electronic mail, travel services, as well as consumer tips and entertainment.

With TRI-WRITER, salesmen can make travel plans quickly and efficiently while away from the office. Students can access the college computer from home or the dorm. Realtors can contact computerized listing services from their client's homes. Just think how important TRI-WRITER could be in your own business.

No one else offers you a sophisticated printer, terminal and typewriter together in one economical unit. Only TRI-WRITER. See for yourself. It's everything you need — and a lot more.



IT'S A FULL FEATURED TYPEWRITER TRI-WRITER is a well built Silver Reed electronic typewriter. It has Silver Reed's outstanding quality and latest technology plus a long, impressive list of sophisticated features only found on very expensive typewriters.

This long lasting and highly successful typewriter is very rugged yet lightweight (only 18 lbs.).

TRI-WRITER™
PRINTING SYSTEM
So sophisticated, it's simple.

BY **QMT**
VAN NUYS, CALIFORNIA

CALL
800-932-9180
FOR THE DEALER NEAREST YOU

Circle 270 on Reader Service card.

IBM compatibility, the system varies from Tandy's current product line, which is aimed at the home and educational market.

The press conference announcing the 2000 was held across town from the convention center at Caeser's Palace and was straightforward and brief. Opposing the trend to announce a computer and then release it three or four months later, Tandy officials proudly announced that their unit would be on the shelves of Radio Shack Computer Centers across the country at 9 a.m. the next day (Dec. 1).

The new Tandy machine is based on the Intel 80186, a microprocessor that is a step above the 8088 in both speed and overall performance.

The Model 2000 will offer popular software packages like pfs:File, pfs:Report, pfs:Graph, dBaseII, MultiPlan, MultiMate and several others. The Tandy machine will also take advantage of integrated software and window-oriented operating environments. Two integrated packages for the Model 2000 are MS Windows, a recently announced product from Microsoft, and Ovation, a product described by Don White (Model 2000 product manager) as "an integrated productivity tool that simultaneously displays and executes word processing, spreadsheets, graphics and databases. We feel that it will be the next major step forward in productivity tools." White added that MS Windows will be available in mid-1984.

In addition to the software products that Tandy will make available, White said that of 100 MS DOS packages tested on the Model 2000, about half ran once copied to the system. "Those which bypassed the MS DOS conventions and directly addressed the hardware did not run," White said.



Traditionally, Comdex features lots of hype, gimmicks and even a few interesting products. This year's show, which set a record for attendance, was no exception.



Yours truly testing out the Tandy Model 2000.

It's a Winner

With the release of the 2000, Tandy seems to have all bets covered. It has been firmly entrenched as a leader in the home and educational field for years. Now with everyone releasing MS DOS and IBM-compatible systems, Tandy has let it be known it will not be left behind.

However, the Model 2000 is not an IBM clone. It is much more. Tandy has done the PC one step better (maybe more than one step). The Model 2000 is a winner.

For more info on the Model 2000, see Frank Derfler's "Overview" column. We'll also be reviewing the system in detail in a future issue.

Sharp New Products

Sharp held a press conference announcing the PC-5000 (or the Commuter Computer, as it is now being referred to). Sharp bills its system as offering the advantage of "big computer capability with the advantages of small computer convenience."

The Commuter Computer offers storage in bubble cartridges (a nonvolatile, highly reliable medium). It also offers dual floppies.

An LCD displaying eight lines by 80 columns, an eight-hour rechargeable battery supply, an optional autodial modem and an optional printer computer (that fits into the unit with no increase in size) make the computer suitable for road trips.

Originally announced at NCC last spring, Sharp has reduced the price from $2500 to $1995. The company plans to position the system between the transportable market and the notebook market. The niche that Sharp plans to fill is for the moment wide open; however, competition could come from the folks at Gavilan when their system is finally released.

The Gavilan system is comparable to Sharp's in both capabilities and in the fact that it has been delayed for release. Gavilan's Mobile Computer is 8088-based, weighs nine pounds (the Commuter Computer weighs less than 11), offers a bit-mapped display of eight lines by 66 characters, an optional printer, a rechargeable eight-hour battery and a full-sized keyboard. The major difference between the two is the touch panel of the Gavilan (a device that lets you move the cursor on the screen with the touch of a finger). The system will sell for a little less than $3000.

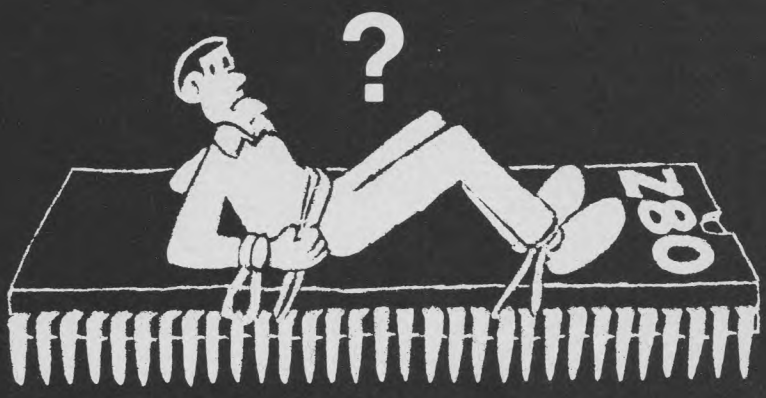
Sharp and Gilvan will both fare well with their systems because there is a need for this type of traveling computer.

New systems were also released by Seequa, Panasonic and Kaypro; however, none offered anything that we haven't seen before.

All in all, Comdex was like its host city—big, glamorous, exciting . . . , but when you get right down to it, there wasn't much there.□

TIED TO 8-BIT PROCESSING

Circle 295 on Reader Service card.



ADD CO-POWER-88 AND BECOME IBM-PC COMPATIBLE

CO-POWER-88 is an 8088 coprocessor for Z80, CP/M computers. Its fast, 5.33 MHz, and has 256k RAM.

MSDOS comes with CO-POWER-88, and CP/M-86 is available as an option. Simple commands move system control from CP/M to MSDOS or CP/M-86 and back.

Most MSDOS, IBM-PC software runs on a CO-POWER-88 system. Run programs from an IBM-PC disk or transfer them to your system's MSDOS disk.

CO-POWER-88 doesn't replace your Z80, so you can still run CP/M... with an added feature, RAM disk. CO-POWER-88's RAM can be used as a high-speed simulated disk drive during CP/M processing.

Best of all, CO-POWER-88's affordable:

256k CO-POWER-88 w/MSDOS and RAM drive software $500.00

Available for: Actrix, ATR8000, Bigboard, Kaypro, Xerox and Zorba computers. And more to come.

Trademarks: ATR8000 and CO-POWER-88, SWP, Inc. IBM-PC, IBM Corp. Z80, Zilog. MSDOS, Microsoft Inc. CP/M and CP/M-86, Digital Research, Inc.

SWP Inc
MICROCOMPUTER PRODUCTS

2500 E. Randol Mill Road — 125
Arlington, Texas 76011
(817) 861-0421 (metro) 469-1181

Prices and specifications subject to change without notice. Specifications may vary for particular CO-POWER-88 systems.

Yes. I'd like to know more about CO-POWER-88.

Send to: SWP Microcomputer Products, Inc.
2500 E. Randol Mill Rd., #125
Arlington, TX 76011

#301B

name _____

street _____

city _____ state _____ zip _____

DEALER INQUIRIES WELCOME.

By Frank J. Derfler, Jr.

Sending Junior Off to School

Tandy's 2000: A Rare Mix Of Quality and Looks

One problem you face when you write a column for a monthly magazine is the lag time between the day you write the words and the day you see them in print. In the micro industry, a lot can happen in the interim.

The editorial staff of *Microcomputing* and I literally threw away the rules two months ago when we brought you the first look at the IBM PCjr. We got the first impressions and pictures into your hands even before many of the weekly magazines and newspapers.

Now I'd like to include a few more impressions. I realize that they're coming to you with a disconnect of several months, but I don't think all of you have made a decision to buy or not to buy a Junior yet.

A Second Look at Junior

I have now had an opportunity to use Junior's keyboard for an extended period of time and I give it passing grades.

Many people criticize Junior's keyboard because of its light weight, small size, square keys or tactile response, but I like it. It's not imposing and the feel of the keys is comfortable for every one but the most experienced touch typist. In fact, I'm writing this article on a Junior keyboard.

The physical position I am in would have caused apoplexy in my high school typing teacher (she was big on sitting up straight with both feet on the floor), but I am leaning way back "beaming" my characters over the infrared link between the keyboard and the Junior and I love it.

What is Junior For?

It is clear to me that IBM has hit its mark with Junior, but you have to understand what that mark really was.

IBM was not aiming for the home market, as almost everyone seems to suspect, but rather for the schools. (Get 'em while they're young and they'll love you for life.)

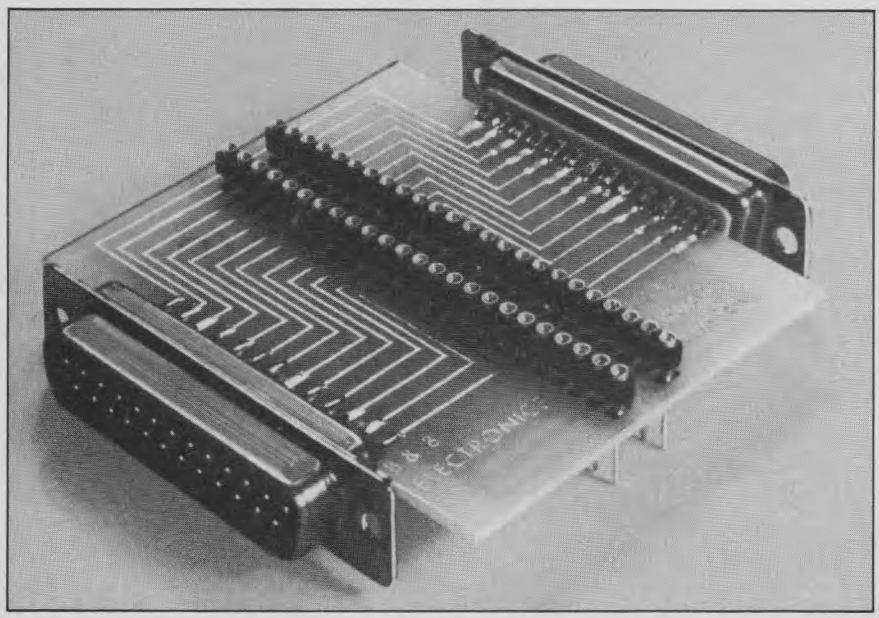
Junior is a great machine for schools. The price without a disk drive is low. Those who say that the entry-level Junior is useless don't understand the application. Teachers don't like disks. (Disks don't like chalk dust!)

The front-mounted ROM cartridges designed for the PCjr have a large capacity (really 192Kb, not the 128Kb that is normally quoted) and provide a perfect way to install educational software into the machine. These cartridges are rugged (teachers love 'em); they can't be easily copied, yet they are easily secured and inventoried (administrators love 'em). The graphics on the Junior are great.

The keyboard on the Junior is perfect for unskilled fingers, but good enough for hands with more experience. The cardboard overlays used to identify the keys give teachers and courseware designers many options.

Students can reply to stimulus on the screen by selecting keys according to their associated colors, shapes, words and other visual features. This capability breaks the mold that many educational software designers have developed of only using the keyboard for character-oriented activities. Many size, shape and color activities can be conducted with a flexible keyboard like the Junior's.

The cordless keyboard is absolutely perfect for passing around a semicircle of students seated in front of a large monitor. It is as safe and as friendly as a doll.



The B&B Electronics Wiring Adapter allows you to connect RS-232C devices together in ways that should meet the needs of any equipment. It is available for $24.95. *See p. 20.*

Contact the author at Box 691, Herndon, VA 22070.

SEIZE CONTROL.



With FingerPrint,™ you've got Apple in the palm of your hand.

FingerPrint functions as the "Print Screen Key" your Apple doesn't have. But that's only the beginning. FingerPrint is more than just a parallel printer interface card. A touch of its button puts any program on hold, so you can make hard copies of *any* graphics or text. And do things Apple never imagined.

FingerPrint consists of the printer interface card connected to a touch-sensitive button that adheres to your keyboard. It also comes with a free printer cable and a disk loaded with programs.



We made FingerPrint smart. You can make it even smarter. The built-in 2K ROM provides functions like **Print Screen, Program Pause, Graphic Dump, Jump to Keyboard or Monitor for De-bugging** and more. With 2K of user RAM, you can invent new functions such as **Keyword Search and Replace** or special tasks only you could dream up.

Circle 241 on Reader Service card.

FingerPrint works with any parallel printer made. And it can be programmed to interface with new printers as they come on the market.

Get the most out of your Apple II, Apple II+ or Apple IIe. Order FingerPrint today. Or visit your nearest dealer for a test flight.

Thirdware has a whole family of innovative computer products. Including a multiple-printer parallel interface, slim-line disk drives, diskettes, disk cases and the only protective sleeves that remain in place while the disk is in use. Write for our latest catalog.



ORDER TOLL-FREE.
1-800-528-6050
Ext. 2112
In Arizona: **1-800-352-0458**
In Alaska & Hawaii: **1-800-528-0470**

THIRDWARE
COMPUTER PRODUCTS™

☐ Please send a free Thirdware catalog and complete information on FingerPrint.

☐ Please send ____ FingerPrint(s) @ $149 each. (Add $3.50 shipping & handling for each one ordered.) FL residents add 5% sales tax.

Enclose check or credit card authorization for full amount.

Name _____

Address _____

City _____ State ____ Zip ____

Charge to: MasterCard/Visa (Circle one)

Acct. No. _____ Expires _____

Signature _____

Mail to: **Precision Software, Inc.**
4747 NW 72nd Avenue Miami, FL 33166 MC

Apple is a registered trademark of Apple Computer, Inc. Thirdware Computer Products and FingerPrint are trademarks of Precision Software, Inc.

Get The Whole Picture



Discover MICROCOMPUTING®

Now you can develop your knowledge of computing instantly. Microcomputing uncovers important trends and new discoveries...then shows how they'll affect you.

Other multi-system magazines are loaded with filler stories. Not Microcomputing. Every issue is alive with useful programs, money-saving projects, instructive columns, and exciting articles. Here are just a few:

- Overview examines industry trends and new technologies in-depth.
- new-product announcements explore state-of-the-art products before they reach the stores.
- extensive buyer's guides save you money as you comparison-shop from home.
- candid reviews of software, hardware, and books ensure that your next purchase will be a sound investment.
- hardware projects help you modify your system to fit your changing needs.
- software conversions widen the scope of your machine.

With all this at your fingertips, you could save the cost of your subscription with one wise purchase.

Subscribe to Microcomputing today. A full year is only $24.97. Just fill out the coupon below or the attached order card and return it right now to: Microcomputing Subscription Department, PO Box 997, Farmingdale NY 11737. For even faster service, call toll free:

1 (800) 258-5473 (In New Hampshire call 1-924-9471)

You risk nothing. If you don't like your first issue for any reason, simply write "cancel" across the invoice and return it. You won't owe a thing.

Subscribe today...and get a 13th issue FREE when you include payment or charge it on your Mastercard, Visa, or American Express.

YES! Give me the whole picture. Send me 12 issues of Microcomputing for $24.97. I understand that with payment enclosed or credit card order I will receive a FREE issue, making a total of 13 issues for $24.97.

☐ Check enclosed ☐ MC ☐ VISA ☐ AE ☐ Bill me

Card #_____ Exp. date_____

Signature_____

Name _____

Address _____

City_____ State_____ Zip_____



MICROCOMPUTING®

342F7

PO Box 997, Farmingdale NY 11737

Canada & Mexico $27.97, 1 yr. only, US funds drawn on US bank.
Foreign surface $44.97, 1 yr. only, US funds drawn on US bank.
Please allow 6-8 weeks for delivery. Foreign Airmail please inquire.

Educational Writers: Get Writing!

The only thing we have to do now is to get the educational software authors to write some good software.

The best educational software is designed to teach the subject programmers know something about: computers. But microcomputers have the potential for helping to interactively teach so many other subjects. It seems that software authors haven't met with the subject-matter professionals to really put together good educational courseware for a wide variety of subjects.

I have a feeling that when the true aim of the PCjr is fully understood, the programming community will rush to support it with high-quality educational software. But remember, it took Lotus a year to develop and release 1-2-3. Good software cannot be developed overnight. It may take a while before the software community catches up with the real capabilities of the PCjr.

Radio Shock

The professionals in the microcomputer game all know that Tandy corporate policy doesn't allow announcements to be made at major trade shows. The company makes announcements in Ft. Worth and spreads the word in various ways throughout the industry.

Well, the professionals were wrong again!

In late November, at the Comdex computer show in Las Vegas, Tandy surprised professionals and amateurs alike by releasing the Tandy Model 2000, a very nice microcomputer system able to use the Microsoft Disk Operating System. Industry insiders knew that Tandy had been negotiating with Microsoft, but almost no one expected the new system to be so powerful or well-integrated.

Surprising Chip Selection

Tandy's biggest surprise came in its selection of the Intel 80186 processor chip. I described the 80186 a few months ago and *Microcomputing* has covered it in an article on the superchips. This chip is more powerful than the 8088 used in the IBM PC and faster than the 8086 processor. Its 8 MHz speed should be particularly useful for graphics processing.

Tandy engineers considered both graphics and expansion capability in the design of the 2000. The resolution in the graphics display is 640×400 pixels in both color and monochrome modes. In contrast, the IBM PC gives 320×200 in the color mode and 640×200 pixels in the high-resolution monochrome mode.

When a new computer able to use MS DOS is released, many people ask if it is IBM PC-compatible. There are, of course, many degrees of compatibility. The Tandy 2000 uses 96 track-per-inch drives that can stuff 720,000 bytes of data on every disk. This is twice the capacity of the drives in the IBM and at this time there is no software utility program that will give the 2000 the ability to read disks created on the PC.

Programs written in languages such as Basic, Fortran and Pascal probably can be run on the Tandy 2000 if they are modified to use the 2000's graphics and recompiled on the Tandy machine. Commercial programs with a major place in the industry, such as 1-2-3, Crosstalk or Knowledgeman, shouldn't need extensive modifications before the developers can release a Tandy 2000 version, but they cannot be used in exactly their present forms.

The Tandy 2000 has ready retail outlets and a good price. But the final key to its success will be found in the kind of support it receives from the third-party hardware and software community.

The Tandy 2000 can be expanded by sliding modules in and out the back of the machine. A mouse controller board, clock, RAM expansion board and future upgrades can be added without removing the cabinet and without using any tools other than your fingers.

Speaking of fingers, my fingers liked the Tandy keyboard. It looks like a version of the IBM Selectric keyboard with modern styling. But I didn't find the touch of the keyboard to be very crisp. It reminded me of the feel of the Compaq keyboard.

I do like the fact that Tandy has provided cursor keys that are separate from the number pad. It can be difficult to use a combined arrow/number pad when you are working with spreadsheet programs that require the frequent use of both functions.

The 2000's computer cabinet, keyboard and monitor are three separate pieces. The monitor and keyboard can be placed on a desk while the system unit resides on the floor or on a separate shelf. A separate tilt/swivel pedestal is available to hold the monitor.

It's What's Inside . . .

Tandy has brought a computer into the marketplace that has strong technical performance specifications and good looks. But if those factors alone guarantee success, we'd all be using Victor 9000s instead of IBM PCs. Victor had all of these factors, but failed to win a major market share.

Once you have technical quality and eye appeal, there are three more things that make a microcomputer popular: retail name, price and support.

It's interesting to note that the Tandy marketing staff stresses a different portion of their corporate name when marketing this machine. Radio Shack appears only as a company logo in the advertising literature. The Tandy name is on the machine and the computer bears the TRS-80 label, but that association is not stressed in the literature. This name change is an obvious attempt to move the 2000 into a class above the rest of the TRS-80 line.

Tandy has a retail sales structure that equals or exceeds IBM's if you count the ability of every Radio Shack store to sell a Tandy 2000 through special order. Tandy could do well with a system that has both a quality look and quality marketing.

The price of the Tandy TRS-80 Model 2000 (as it is officially called) is competitive. A Tandy system with 128Kb of RAM, two high-capacity disk drives, monochrome monitor, serial port, parallel printer port and DOS has a list price of $2999. A similarly equipped IBM PC has a list price of $3658. A Tandy 2000 with a 10Mb hard disk drive sells for $4250.

The Key: Software Support

The Tandy 2000 has ready retail outlets and a good price. But the final key to its success will be found in the kind of support it receives from the third-party hardware and software community.

Traditionally, Radio Shack has not allowed any products that don't bear the corporate label to be marketed in its stores. The company seems to have broken that corporate practice with the Model 2000, too.

Radio Shack Computer Centers are carrying some standard industry products packaged for the 2000. These products include the members of the pfs family (Write, Graph, File and Report), Microsoft Word and Multimate for word processing, dBaseII as a database management program and MultiPlan for a spreadsheet.

Other software is available or under development for business applications and communications. If vendors write programs that take advantage of the graphics capabilities in the Model 2000, they may find a good market in Radio Shack stores. Radio Shack's attitude toward third-party hardware for the 2000 is untested.

The Tandy 2000 has potential. It's a capable machine with a reasonable price. If the Tandy people adopt an enlightened attitude toward third-party hardware,

software and accessory support, their retail power could give them a good share of the 16-bit computer market.

A Good Printer Value

There are a lot of decent printer values in the industry right now, and competition is favoring the buyer.

I want to describe one printer I've been using for several months: the Mannesmann Tally Spirit 80. It isn't particularly fast; it prints at 80 characters per second, which is about eight times faster than anybody I know can type, but which is still about half the speed of some dot matrix printers on the market. The Spirit 80, however, is well-priced, nice to use and capable of producing excellent quality print.

The Spirit 80 has a $399 price tag, but you may see it discounted even below that price. It prints characters using a 9×8 dot matrix, but the print wires on the Spirit 80 are square instead of being round—as they are on other dot matrix printers. Mannesmann Tally provides a film ribbon cartridge for the Spirit 80 that gives excellent quality print. All of the other ribbons I have seen for dot matrix printers use a cloth ribbon.

Film ribbons have a shorter print life than cloth ribbons, but the results are better. I ran about 500 double-spaced pages through the printer before I had to replace the ribbon.

One of the nicest things about the Spirit 80 is the way it looks. It is nicely styled, with a smoke-colored cover over the printing area; this cover lifts out of the way when you want to get at the paper. It's easy to load paper into the Spirit 80 and equally easy to get it out.

I won't drag you through a blow-by-blow description of all of the features of the Spirit 80. It simply does all of the things you expect a quality modern dot matrix printer to do, and it has an excellent price and a good-looking design. I use it, I'm happy with it and I rate it as an excellent buy.

Look through the pages of *Microcomputing* for dealers carrying the Mannesmann Tally Spirit 80 or call Mannesmann Tally at 206-251-5500 for more information.

Data Communications And Other Matters

In case you're not a regular reader of "Overview," you should be aware that I regularly comment on the happenings in the data communications world. People using microcomputers as data communications devices can get information from services like The Source and CompuServe and exchange information through electronic message systems operating around the country.

If this topic interests you, stop at your local book store and have them order *Microcomputer Data Communications Systems* written by me and published by Prentice-Hall. (Ask for ISBN 0-13-58071203.)

With that small introduction, I'll comment on some interesting changes that have recently taken place in the data communications world.

Crosstalk XVI Update

Crosstalk XVI is a capable communications program that runs on microcomputers using the CP/M and Microsoft operating systems (including the IBM PC), but it didn't previously include the common Xmodem quality control checks.

There are a lot of decent printer values in the industry right now, and competitiion is favoring the buyer.

After several years of subtle hints and not-so-subtle coercion, Les Freed has given the Crosstalk XVI communications program the ability to use the Xmodem (Christensen) file transfer protocol in addition to the Crosstalk protocol. This new capability allows you to use Crosstalk to capture files from many bulletin board systems that only use the Xmodem protocol.

A protocol file transfer involves frequent quality control checks between the transmitting and receiving ends. If the data received doesn't match the data that was transmitted, it is resent until it is correctly received. Now Crosstalk XVI can use either protocol. This change makes a good program even better.

Microstuf has a good upgrade policy, so if you are a Crosstalk user and would like an upgrade, or if you need a good communications software package, contact Microstuf, 1845 The Exchange, Suite 205, Atlanta, GA 30339 (404-952-0267).

Nifty Modem For The Vic and Commodore

The Microperipheral Corp. people want all of you who received Commodore-64s for Christmas to know that they have a way for you to participate in the world of data communications. They are marketing a modem for Commodore machines that includes a port you can use to drive a printer using the common parallel printer interface.

A modem, as you know, is a device that translates between the data signals used over telephone lines and those inside your computer. The AutoPrint-Microconnection lets you communicate at speeds of 300 bits per second. It will automatically dial telephone numbers on your command and answer a ringing telephone line.

The combination modem and printer interface plugs directly into the computer. The manual provides you with a listing of a program you can use for telecommunications.

One word of caution: not all word processing software will let you send data out the printer port that the AutoPrint-Microconnection provides.

This device costs $149.95. If you're interested, get more details from the Microperipheral Corp., 2565 152nd Ave. N.E., Redmond, WA 98052. Phone them at 206-881-7544.

RS-232C Adapter

The signaling scheme used to connect computers to modems, printers and other devices is called RS-232C. It's a standard that includes many different options.

Some of the options used by different manufacturers can make it difficult to connect different pieces of equipment together without a lot of trial and error.

I have come across a line of equipment marketed by B&B Electronics that saves a lot of hair-pulling if you have to connect or troubleshoot RS-232C devices.

B&B markets several connectors and adapters for RS-232C wiring, and among their products they have an RS-232 Tester and an RS-232 Wiring Adapter that are simple but useful. The Tester contains a series of light-emitting diodes that tell you what signals are present on the line.

This is valuable if you don't already have a product like the MFJ Enterprises RS-232 Transfer Switch that also gives you this function. You can monitor the flow of data, see the controlling signals being exchanged and look for signals that should be there but aren't.

However, knowing what is there and doing something about it are two different things. The B&B Electronics Wiring Adapter lets you insert temporary jumpers between two devices to help you find the right signals fast. Standard integrated circuit DIP switches can be inserted into the wiring adapter to make connections on a more permanent basis if you wish.

This little inexpensive device can save you a great deal of time. It costs $24.95. The RS-232 Tester is $39.95.

Contact B&B Electronics, Box 475, Mendota, IL 61342 (815-539-5827) for a catalog of its products. The capable MFJ RS-232 Transfer Switch I mentioned above is available at prices starting at $79.95 from MFJ Enterprises, 921 Louisville Road, Strakville, MS 39759 (800-647-539-5827).□

Circle 307 on Reader Service card.

FRIENDLY COMPUTER Satisfaction Guarantee: refund or exchange within 14 days (less shipping) if returned in original MINT CONDITION with all papers (as shipped)

FRIENDLY SERVICE AT A FRIENDLY PRICE

Friendly Computer Center, Inc.

1381 Coney Island Avenue, Brooklyn, New York 11230

Must Have It Immediately? Ask for GREEN LIGHT SERVICE For Same Day Shipment

TO ORDER CALL TOLL FREE **(800) 258-5805**
From Continental USA, Virgin Islands and Puerto Rico

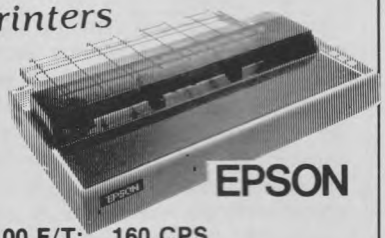
FOR INFORMATION CALL **(212) 252-9737**

Computers



386K w/valdocs and CP/M
Super Special!
Free RX-80 printer
and Peachtree 5000 software
We Service all Epson products
Sorry **NO Mail Order** on QX-10.
Computer displayed and sold in store only.

Printers



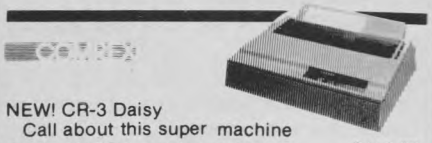
FX-100 F/T: 160 CPS
- Accepts 15" paper • seven graphics modes.
- Downloadable characters • 1:1 plotter mode.
- THE BUSINESS PRINTER!

MX-100 F/T: 100 CPS:
- Grafftrax + • 15" paper.

RX-80 F/T: 100 CPS.
- Six dot graphics modes.
- Special quiet mode • 9½" paper
- Single sheet & tractor feed.

Super Low Price

RX-80:
- Epson economy price • 100 CPS.
- Same as RX-80 but tractor only



NEW! CR-3 Daisy
Call about this super machine
CR-I . 17 CPS - wide carriage..... $459.00
CR-II . 12 CPS . 9½" paper, 5K buffer .... Call

"After Sale Friendly Support"

TAKE ADVANTAGE OF OUR 8 YRS EXPERIENCE SERVING BOTH PROFESSIONALS AND AMATEUR ENTHUSIASTS WORLDWIDE

We will ship orders at the advertised prices. Prices guaranteed until Mar. 1, 1984.

FRANKLIN
COMPUTER CORPORATION



ALL FRANKLINS RUN APPLE SOFTWARE

FRANKLIN ACE 1200 OMS System

Includes:
- Two Computers-in-one
- Ace 1200 Computer 128K
- 2 Ace 10 Built in drives
- Ace CP/M Card (6 MHZ)
- Parallel printer interface
- Serial Interface
- 80 Column Card
- Wordstar w/Mailmerge
- ACE CALC Spreadsheet
- Your choice of - Green, Amber or color monitor

Call for Low Low Price

FRANKLIN ACE 1000 PRO PACKAGE
- Ace 1000 64K
- Ace 10 Disc Drive w/controller
- Ace 80 column card • Franklin green HI-RES monitor

Ace Writer word processor
- ACe Call Spreadsheet
- Data Perfect Database
- Personal Financier
- Friendly Tutorial Disk

SUPER LOW PRICE

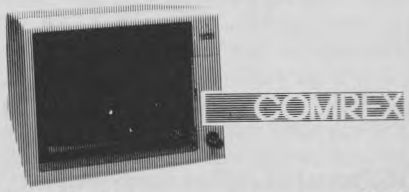
APPLE IIe Starter Kit
with Disc Drive, 80 column card,monitor, in stock
Super low Price

SANYO MBC-555
IBM compatible
- 128 K RAM • Monochrome & RGB adaptors
- 2 160K drives • Word start w/Mailmerger
- Infostar • Spellstar • CALC start

$1149.00

Sanyo MBC-550
with drive & software
$795.00

Monitors



CR-6600 RGB	339.00
CR-6500 13"	color 249.00
CR-5600	129.00
CR-5400	99.50

AMDEK

Video - 300	$134.90
Video - 310A, IBM	$189.90
Color - 1	$304.90
Color - IV Hi res RGB	$1,049.00
AMDEK color-1 plus	299.00

MODEMS

HAYES 1200B - IBM
$429.00

HAYES 1200RS-232
$475.00

HAYES 300-RS-232
$195.00

HAYES APPLE IIe w/software
$239.90

NOVATION J. Cat
$91.00

Supplies

Floppy Discs

10 IBM DS/DD	39.95
10 MEMOREX DS/Dd	29.98
10 TDK SS/DD	23.95
10 SS/DD ATLAS PREMIUM	17.49
FLIP 'N FILE (50)	25.95

STORE HOURS: MON.-THURS 9:30-6:30/FRI. 9:30-2:00/OPEN SUNDAY 10-4

Apple is a registered trademark of Apple Computer, Inc. **IBM** is a registered trademark of International Business Machines. **FOR MAIL ORDERS:** Send Money Order, Certified Check, Mastercard, VISA gladly accepted. Add estimated price for shipping, handling and insurance, guaranteed til **Mar. 1, 1984.** All orders are subject to our acceptance and verification. This ad supersedes all previous ads. Not responsible for typographical erros. No returns on software.

TO ORDER CALL TOLL FREE **(800) 258-5805**
FOR ORDERS ONLY - EXCEPT ALASKA, HAWAII & N.Y

FOR INFORMATION CALL **(212) 252-9737**

VISA

Friendly Computer Center, Inc.

MasterCard

1381 Coney Island Avenue Brooklyn, New York 11230

By Thomas Bonoma

Probing A pfs Crash

Patience Helps In Pinpointing The Problem

Of Pictures, Mice and Words

This month, we'll look at second-generation software, including graphics packages and the ubiquitous word processor.

Though unreviewed packages are piling up knee-deep around here, it's important to examine each package thoroughly before reporting on it.

With the increase in integration, complexity and the average price of software, you deserve as thorough an evaluation as I can gin up. On this score, keep up the mail. It's most helpful to me, and I'm glad to respond to your problems or hear your opinions.

Solution to the Mystery

Over the last two months, I've teased you about a problem with Software Publishing Systems' pfs:Report and challenged you to find the cause. In brief, the problem is with pfs:Report crashing in the middle of report generation with an I/O #7 Error, which is not even in the manual.

I hinted that you had just made some hardware additions to your machine (a Tecmar board and RAMDisk). I hinted more strongly that there were no bugs in pfs:Report that were causing the problem.

The problem, which I never would have found by myself, is something that's going to become more common as increasing numbers of third parties contribute software and hardware to the PC.

It turns out that both the Tecmar RAMDisk software and the pfs:Report package won't run at the same time. It is unclear whether they both claim some similar portion of memory or use a common interrupt call; the symptom, however, is that the program crashes in mid-run, through no fault of its own.

The problem with "bad interactions" between two software programs is that they are almost impossible to diagnose unless you're very patient or sophisticated. I wasn't; I promptly picked up the phone to call the pfs people and complain about their "faulty" software. Therein lies a tale from which we all can learn.

Patience

Not only did Marv Parsons, pfs:Report support staffer, *not* hang up on me when I accused pfs of marketing buggy software, but he spent almost an hour on the phone with me—both of us at our keyboards—in order to diagnose the problem.

I wouldn't have found the answer in a million years. It was only Marv's patient questioning and parallel running of my reports while noting of the differences that eventually led me to suggest that I had put a new board in the machine and that it had a RAMDisk that loaded at boot time.

When we booted the machine without the CONFIG.SYS file that automatically calls the RAMDisk, there were no problems!

So what, you say? Well, just try getting that level of support from many vendors selling programs more costly than pfs:Report and you'll find out.

They'll ask you for a couple hundred dollars "support fee" so you have the right to call them on the phone, they'll refuse to answer or they'll refer you to the dealer, which is as useful as suggesting that a fellow in a sinking boat learn to breathe under water!

I became curious about what sort of management systems Software Publishing might have that allows this level of support for less expensive software. I learned that the product managers at that company must man the support phones twice a week in order to stay close to the customer and learn some things about using the package in the real world.

Law and Order

If business had laws, this would be one to cast in concrete—good support and better products come from forcing management to be close to end users.

Since there are no laws of business beyond the competitive marketplace, let's make some laws by voting with our dollars for firms like pfs. The responsiveness shows a level of support and post-sale service unparalleled in the microcomputer software industry.

On that note, I understand there are two new pfs products coming out, as well as a major revision of the pfs:Write package in the works. The two new products are pfs:Proof, a 100,000-word spelling checker, and pfs:Access, a useful telecommunications program that integrates with pfs:Write, File, Report and Graph. I'll have reviews of these for you in a month or two—stay tuned!

A New Graphics Release

Business and Professional Software (BPS) has released a new, DOS-compatible revision of its powerful BPS Business Graphics program. The original Pascal code has been made to run under DOS, a partial solution for the incompatibility problem operators ran into with earlier versions of this graphics package.

Although it is still a challenging and complicated business to get spreadsheet output, for instance, from 1-2-3 into BPS, at least both programs now run under the same operating system.

The BPS graphics package itself is unchanged from earlier releases. The same simple, English-like, interactive command language (for example, Draw Axes, Draw Bar) is used to get charts on the screen, and BPS continues to support the widest variety of printers and plotters in the business.

"Take" files, which allow prerecording

Address correspondence to Thomas Bonoma, 45 Drum Hill Road, Concord, MA 01742.

of graphics commands, serve as a crude but effective programming language that allows you to prespecify many of the more tedious and repetitive steps in graphing.

You can, for example, automate a graph to generate company actuals and also automate the forecasting process for the next few years (see Fig. 1). Then all you have to do in order to generate different forecasts is to change the data file.

These take files fall short of a true programming language. There is no macro facility to automate bar charting for any datafile you'd care to name. However, they still go a long way toward making graphics easy if you're willing to put the additional effort into the first graph you make.

BPS Advantages

The package continues to have some competitive advantages over other graphics packages as well. There continues the full array of mathematics commands (add, subtract and so on) by which you can transform a datafile any way you choose.

The good statistical commands generate routine statistics on all files and permit data smoothing and moving. After you have finished with your data, you can express it as a variety of graphs.

BPS still has some of its old disadvantages in the new release, too. You can't do text charts, a major drawback since managerial presentations are only infrequently composed of pure graph presentations.

The Interchange command, through which ASCII and other text files can be read by BPS, is a miracle of obfuscation. The manual, which includes a superb reference card and wall chart, struggles mightily to explain the process. However, it's difficult to get files into BPS unless you happen to use MultiPlan exclusively as your spreadsheet.

Also, the program limits your output to one "write" device, such as a printer, and one "set" device, such as a plotter or a letter-quality daisy wheel. This forces you to learn more about the nature and restrictions of each kind of device than any manager would want to know.

Nonetheless, the upgrade at $125 is great because you don't have to reboot to a "foreign" operating system in order to use your graphics package. If you're not a user now, then this switch-over to the DOS system is incomplete. But it makes BPS a good competitive entry along with Chartman and Chartmaster.

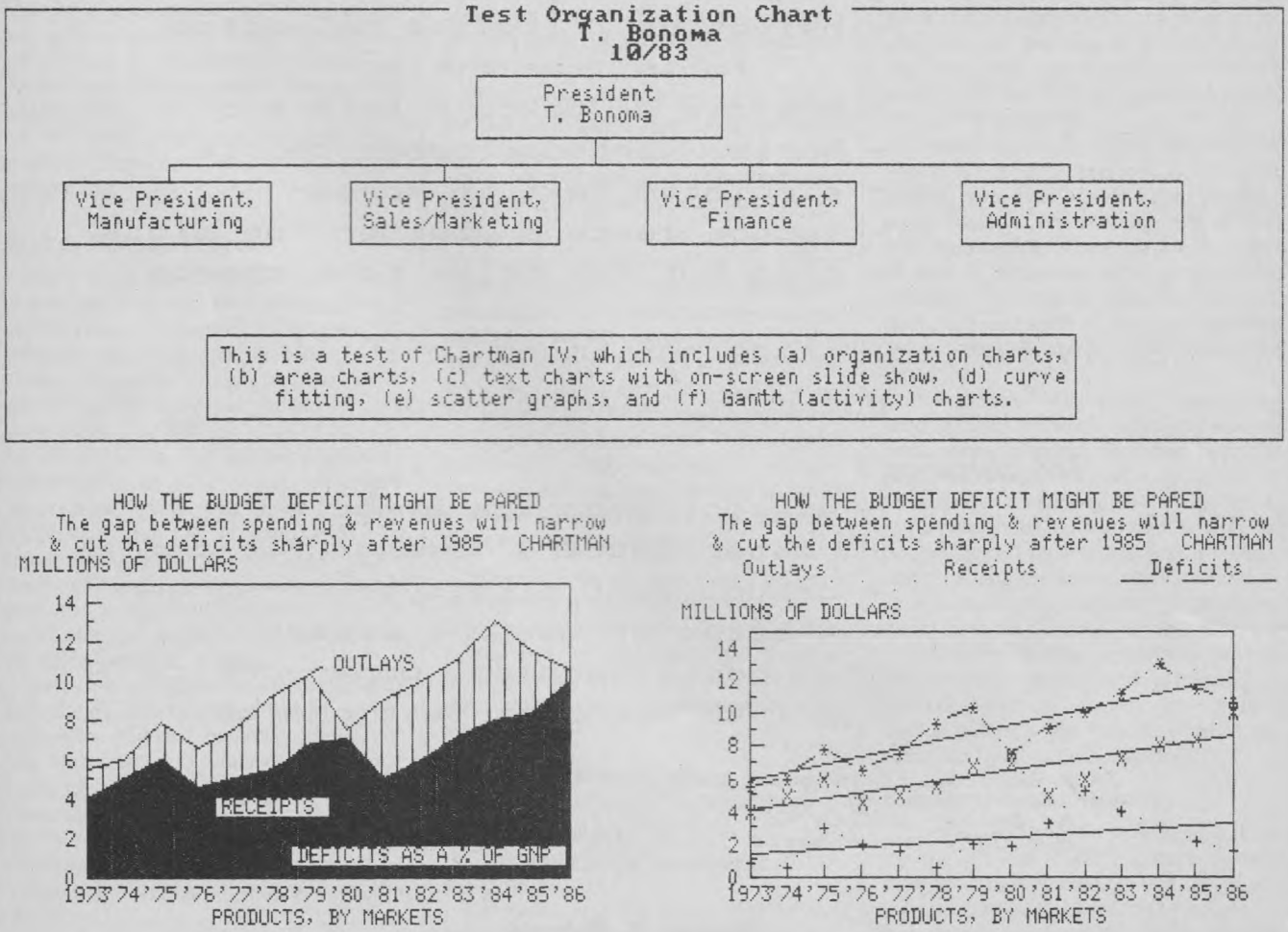
Charting Chartman

Speaking of Chartman (from Mosaic Software), Chartman IV has been released, but it's a strange "product line extension" for Mosaic's other software. The problem's not with Chartman IV; this package produces organizational charts, Gantt charts for job scheduling, area fill charts, scatter graphs and text charts. It also handles curve-fitting chores. Fig. 1 shows some of these abilities produced on an IBM PC with an HP plotter.

Like all of Mosaic Software's offerings, Chartman IV is an easy-to-use model with good design. It does have a few quirks, however, that are hard to understand. For example, the program supports an IDS color Prism printer, but only if it is hooked up through the parallel port (and not if you have a serial configuration).

Marvels of Inconsistency

Text charts, strange to say, can be displayed on the screen (as can all of Chartman IV's output) and printed on a print-



Figs. 1 and 2. Examples of Chartman IV's area fill and organization chart output on Epson's FX-80 printer.

er, but not plotted on a plotter! Other types of charts can be output either to printers or plotters, a marvel of inconsistency. Perhaps this is because Chartman IV supports the use of special printing symbols like the trademark sign, "bullets" and boxes in constructing text charts, which may be hard to get out to the plotter.

At any rate, you can't make text chart transparencies with Chartman IV, a major shortcoming. Finally, a special Helvetica font, which the program makes provision for, is not included in release 1.0 of Chartman IV, narrowing your choice of fonts for graphics output.

In other respects, though, the program is as competent as they come. Data entry is easy, clear and usually reliable, although I was able to "lose" a data file in Chartman IV after I'd saved it to disk.

The program's flexibility, especially for the organizational and area charts shown in Figs. 1 and 2, is broad, and it will be useful to most managers, since it takes only a couple of minutes to design most organization charts. This flexibility is carried over to curve-fitting and area charts as well. Most graphics formats allow two y axes, for example, log or linear scale plotting and a wide variety of text labels, data symbol labels, grids and other graphics options.

Even Gantt charting, traditionally an arcane art, is simplified by Chartman's good menu-driven structure and easy interaction with the user. (I can't, however, show you a Gantt chart, because the package Chartman sent me inadvertent-

TEST OF SUPER CHARTMAN II VERSUS CHARTMAN IV TEXT CHARTING ABILITIES

SC II has unique abilities not found in SC IV and few restrictions:

For instance,

+ normal (this) or slanted text
+ helvetica / italics helvetica fonts (see titles)
+ 8 sizes of text, 8 colors of plot
+ horiz./vertical paper choice
- simulated text on screen
+/- vector letters (better for plots)
+/- plot but not print text charts

SC IV has abilities not found in SC II but many restrictions:

For instance,

+ special graphics symbols
+ raster letters (better for print)
+ actual text displayed on-screen
- 4 sizes of text, 4 colors
- no horiz/vertical paper choice
- print, not plot text charts

In practice, it is good that Chartman II and IV are capable of communicating, because they need it. SCII is probably the better choice for flexibility and presentation needs but CMIV works better with dot-matrix printers and has special symbols.

Thomas V. Bonoma

Fig. 3. Differences between Chartman IV and Super Chartman II on HP7470A plotter (run on Chartman II).

ly included two area disks and no Gantt disk. I am judging from the manual only on Gantt charts, and I was unable to test this portion of the software in use.)

Comparing Chartmans

The strangeness I alluded to above comes when the prospective or current Chartman user makes a natural comparison between Super Chartman II, an earlier product in the Chartman line, and this new release. A natural assumption is that, by buying both packages, II (with pie, line, bar and text graphics formats) and IV (with organiziations, area, Gantt and text formats), you'll have a complete set of compatible graphics routines that complement each other and do not overlap.

That is and is not the case, as Fig. 3 (produced on the Chartman II system) shows. Not only is there overlap between the two programs but, depending on your system configuration (say, a printer but no plotter), one package will be more useful than the other for text charts.

Fortunately, the two programs can communicate data files, so with both of them you can satisfy most of your graphing needs, but at a steep combination price.

Unfortunately, each system uses a separate "Key Diskette," which locks the user out of the program until it is inserted into a drive, so if you do get both packages, you'll be inundated in disks and you'll never be sure which key goes in which lock.

I like both programs but find they aren't well-integrated as part of a graphics system.

Word, Word, Word

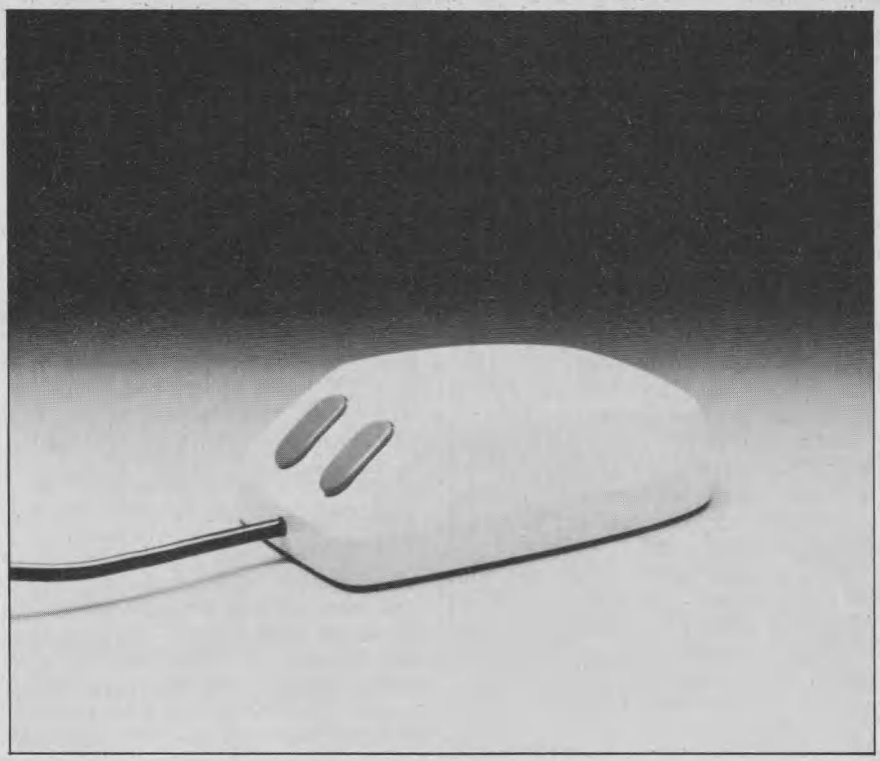
What would you think of a major word processing program that comes with a mouse, nearly unlimited formatting options for your dot matrix or letter-quality printer, extensive on-line help, multiple windows and color capabilities if you want them?

Let's dream on and ask for full macro capabilities, so that with a single keypress or two we can type our return address at the top of each letter, in typeset-looking text to boot! Let's ask for cursor-pointing block marking, word, sentence, line, paragraph and document block marking and move capabilities, all by either mouse or cursor.

Let's also ask for complete integration with the PC function keys, full what-you-see-is-what-you-get, on-screen reformatting (automatic, of course), even with weird graphics characters. We also want changeable tabbing—by inch, centimeter, point (as in 8-point type) or character position, and the tabbing should be changeable for every paragraph in the document.

Dreams Do Come True

There. . . we dreamed it, but it's not a dream! Microsoft's Word, version 1, has just been released, accompanied by a consumer sampling program of a demonstration disk unparalleled in industry history.



The Microsoft Mouse.

The program is everything we asked for and more; with or without the Microsoft Mouse (see below), it is a joy to use and is without peer as the best on-screen formatting program in existence.

The way to think about The Word, whose output is illustrated in Fig. 4, is as a graphics program that processes words rather than as a word processing program that handles on-screen formatting well. That is to say, a variety of fonts, print sizes (point type sizes of 8, 10, 12, 16, 20 and 24 are offered with a number of the fonts) and the usual array of bold, underscore, double-underscore, struck-through and italic typefaces are instantly available at the touch of an Alt key combination from The Word.

These formats are shown on the screen as they occur—no control-Ps or control anythings, just the small capitals, italics, bolded text or whatever right there in front of your eyes. The program's on-screen text formatting abilities are truly awesome.

Words You'll Want to Hear

The same is true of The Word's print formatting capabilities, especially with the Epson or IBM-compatible set of matrix printers.

Currently, only the Epson/IBM dot matrix printers are fully supported for output gymnastics, although The Word makes provision for a number of other dot matrix and letter-quality (NEC, Diablo, Qume, and a general, TTY-type impact) printers as well. On the latter printers, however, you change fonts by changing type balls or thimbles. On the dot matrix printers, all font changes are handled by the program.

Perhaps the most unique aspect of The Word is its style sheets. With style sheets, you can inform the program about the font, typeface, spacing and all other formatting aspects of any number of writing elements, such as footnotes, headings, "normal paragraphs" (like this one), lists and such so that the program automatically formats these as they are typed in.

Style sheets help assure consistency among users between input and output and, more importantly, they allow a single keyboard entry of a document to be output in a number of different forms.

For instance, a document written in double-spaced pica font type, in 8-point and in a single column, with margins at zero and 60 (the normal WordStar settings) for draft purposes can be reformatted as three-column, article-style text in proportional spacing with professional-looking headings—merely by "attaching" a different style sheet to the document, and without a keystroke!

Strange and Silent Mouse

The mouse, at first a strange and silent partner on the desk, becomes quickly indispensable for editing, command entry and revisions. Move to the left of the screen frame and you can use the mouse buttons to "thumb" through the document, to move in a flexible manner any-

where between a single line, up or down, to "about ⅔ of the way through the document."

Move to the top of the frame on the screen and you can open or close additional windows (The Word supports eight such windows) where you can load outlines or diferently formatted versions of your same file. Move to the top right corner, hit the left button and a "ruler line" will pop up to enable you to tabulate better.

Move to the right side of the frame and open horizontal windows or to the bottom to scroll beyond 80 columns if your file is wider than the screen.

But it is in the file, not in the borders, where the mouse really shines. Move to any word, hit the left button and roll the mouse anywhere to mark text for copying, deletion and so on.

Move to a special "style bar" near the left end of the screen and mark an entire paragraph with a keystroke. Move to the bottom, command line area of the screen, hit the delete key and copy that paragraph to a macro. After typing "radress," it prints your full name and address, centered, in small capitals and 16-point type, bold and italic. Request help, enter commands, revise, edit, move around, mark copy—all with the little mouse!

Headers, footers, footnotes and a lot of other writer supports are all marvelously unrestricted and flexible. You can have not only multiline headers, but multiparagraph ones as well. Same for footers.

As for footnotes, the program automatically numbers them, shows you the super- or subscripting marks and automatically jumps to the end of the file, where such things as footnotes are kept so you can enter them there or at the bottom of the page.

Macro Matters

The macro function, which allows stored macros like "radress" to be kept in a glossary and any number of specialized glossaries to be created, is a very flexible. Windowing, which you can select (when you call up The Word) in a color capability, allows a choice of background and foreground color, eight different windows and easy jumping between them, carrying text if you'd like.

There is even a function to import your WordStar files, so you won't have to retype them. The Word even remembers choices, including the last printer you specified, in a file every time you use the program so you don't have to continually respecify choices you've already made.

OK, OK, let's buy 100, right? Right, this is in the category of a solidly positive recommendation but it is not unqualified, even though this is version 1.0 of the program and more releases are sure to come. Because Word is so powerful as a screen and print formatter, you should be prepared for somewhat slower printing and slower file saving than you may have become accustomed to.

four minutes to print in fancy styles, like proportional spacing or double-strike modes, or with a lot of font changes. This

My measures indicate that a one-page document can take more than three to

---

MICROCOMPUTER MANAGEMENT
45 DRUM HILL ROAD
CONCORD, MA 01742

Dear Desktop User:

Thanks for your order...you should find everything you need to run *Desktop* on the enclosed disks. Disk Number 1 contains the DT program itself, which runs under Lotus 1-2-3, REVISION 1A ONLY. Disk 1 also has the SAMPLE.WKS file, a partially filled-in worksheet on which you can practice before setting up your own *Desktop*. Disk #2 has additional files. INSTRUCT.WKS is a worksheet template with full instructions for Desktop (there are also instructions embedded in the program itself). DESK.DOC is a documentation file that you should print on your printer (put disk #2 in Drive A: and type COPY A:DESK.DOC LPT1:). There is also a facility, COPYINST.BAT, which tells you how to make legal copies of DT for your friends with the copy facility, DESKCOPY.BAT. Run COPYINST before DESKCOPY so you'll know what to do.

There are (December, 1983) no reported bugs in the program, so enjoy! I am working hard on Revision 2.0 of DT, which will have an on-board calculator and much more. **Stay tuned!** This is the superscript and this the subscript mode!!!

Your two diskettes have been formatted in 8-sector, nonsystem format, which is to say, they'll run under DOS 1.1, 2.0, and on the COMPAQ too.

PLEASE SEND ME YOUR COMMENTS, CRITICISMS AND SUGGESTIONS FOR FUTURE REVISIONS OF DESKTOP. YOU CAN WRITE AT THE ADDRESS ABOVE, OR COMMUNICATE WITH ME ON SOURCE TCD292.

Thanks,

Tom

Tom Bonoma

Fig. 4. This correspondence from the author's software company, Microcomputer Management, to users of the Desktop program is an example of the type of output capable with The Microsoft Word word processing package. It was run out on an Epson FX-80 printer.

problem is solved easily with a print buffer, either on-board or outside the machine, and is significantly helped by Word's print-queueing capabilities.

That's not a real problem. But read on . . .

Some Problems

What else could you want? Well, files are not stored in ASCII format, which means not only does The Word have no spelling checker, but you can't use a stand-alone one with its document files unless you print to disk, check and then print. This is tedious at best.

It has no mail merge capabilities and, therefore, no way to do form letters. There is no way to import even MultiPlan spreadsheet files in this version except with the print to disk routine outlined above, a shortcoming.

However, there's one command I haven't told you about. It's called Library, and choosing it at this time just gives you the message "Library reserved for future use."

Disregarding the terse syntax of the message, it takes little insight to see that three of my major criticisms about Word have to be the first three additions to the Library: that is, mail merge, automated file importation and a MultiPlan link.

None of that takes insight . . . what does, though, is reasonable speculation about where the program may go from here. It's important to recognize that The Word is essentially a graphics program that draws on the screen. It just happens to draw words at this point in time. Think about the integrated text/graphics opportunities that would be available if the program designers also see this simple but powerful point.

The Word version 1.0 will not drive WordStar off the top of the heap now because it lacks features many users need.

On the other hand, it *will* be a best seller, and you should buy it because it is the start of the future in word processing, where ideas are the main thing. It doesn't take a lot of crystal-ball gazing to see that, with inevitable line extensions to spelling and the like, The Word is going to be a working classic.

The manual and on-line help, by the way, are solid, although the manual is somewhat tough sledding. That isn't because it's poorly written or unclear, it's because the program is doggone complex if you want to explore its further reaches.

You'll need 128Kb of memory, a single disk, a color/graphics monitor adapter (you don't need it, but to see all of the fancy stuff instead of just underlined or bolded text, you do), DOS 1.1 or 2.0 (The Word handles path names—hooray!) and a printer.

I recommend one of the Epson/IBM graphics dot matrix printers to get the full power out of this tool; you won't believe the output came from the Epson! Oh yes, get the mouse, too; it has uses that go far beyond Microsoft Word.

Mousie, Mousie, Who's Got the Mousie?

The Microsoft Mouse is sold bundled with the Word, but you can buy it separately from Microsoft. It's worth the $195 price tag; it's a nice peripheral/software combination on its own.

The package consists of the Microsoft Mouse itself, machine-level driver software, several illustrative applications programs using the mouse in Basic and an interface card by which the mouse and the PC can communicate. Installation is fast, easy and almost foolproof if you can handle a screwdriver at all.

Software installation is even easier, being (with DOS 2.0) simply a matter of including a DEVICE = MOUSE.SYS call in your configuration file CONFIG.SYS at boot time.

On the Balls of Its Feet

The mouse consists of a rolling ball (remember track balls in arcades?) and two buttons or switches. As the ball is moved, it translates rolling into directional data and passes it to the mouse software to move a cursor on the screen.

A number of different system calls, usable from Basic, Pascal, Fortran and other higher-level languages, allow you to configure Mouse for use with your programs. Depending on whether you're using Mouse in text or graphics mode, you can predefine the shape of the cursor (to a pointing finger, for instance), set and get the cursor position from the mouse, check for button pushes, count the number of button pushes that have occurred and even use the mouse to emulate a light pen.

Mouse Mickeys

The mouse moves in units of distance called mickeys. Each mickey represents about 1/100 of an inch, so that the mouse can be as sensitive as your smallest screen unit even in high-resolution graphics mode.

The applications programs are not trivial—they're useful as software in themselves and especially as tutorials for learning mouse programming skills in Basic. There is, for instance, an interesting piano program that shows a keyboard on the screen to let you play mouse music.

There also is the obligatory game of Life, well-done but not very interesting (it runs in black and white on the color screen). Finally, there is a useful etch-a-sketch program that someone has taken the trouble to do well so that you can save, recall and even print the artwork you create.

As picky as I am, I'm going to break with precedent this month and recommend both of these fine products to you. Be sure you understand the limitations of The Word before you buy it and give yourself enough time to learn it well before making your judgments.

Coming Up

Next month, we'll look at an interesting if somewhat more traditional word processor that can save graphics from programs like 1-2-3 and then print them as integral parts of your document. And it comes bundled with a card filer, too!

We'll also take a close look at The Idea Processor because it's a significant release. Additionally, maybe I can whittle down the backlog a little bit and tell you about some of the good programs, like AutoCad, 4-Point Graphics, Set-FX and Multimate, that have been accumulating on my shelf.

We'll take a look at Power Text Revision 2.0 and Letterform 1000 as well.

Hold tight. These guys keep writing this stuff faster than I can tell you about it!□

The "Big Blue" Black Book

Prices and Addresses of This Month's Featured Products and Companies

BPS Business Graphics
Version 2.6 (DOS compatible)
($125 to current owners)
Business and Professional Software, Inc.
143 Binney St.
Cambridge, MA 02142

Chartman IV ($300)
Mosaic Software, Inc.
1972 Massachusetts Ave.
Cambridge, MA 02140

Microsoft Word ($395; with a mouse, $475)
Microsoft Corp.
Bellevue, WA 98004

Microsoft Mouse ($195)
Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004

By Mark Robillard

Exploring System Engineering

Portable Designers: Make a Statement

Throughout this magazine and dozens like it you'll see reviews, product announcements, comparison studies and general hoopla regarding the new wave of portable computers. Contained within this voluminous media blitz will be many technical claims of superiority over existing desktop systems.

"Battery-operated" and "briefcase-compatible" will become household words at every hacker's breakfast table. You might ask, what advances in engineering could have caused all this commotion?

The Portable Systems Engineering World

This month, "Techniques" looks into the world of portable systems engineering. It is this discipline that is responsible for the recent overturn in computers. I will attempt to introduce you to some of the advances in micro technology that contribute to the field, starting with a general description and block diagram.

As you may know, a typical microcomputer system in use today resembles the functional diagram in Fig. 1. With the microprocessor in control, a series of almost unlimited options of functionality exists. The diagram shows an expanded arrangement of peripherals, but not one unlike most serious computer enthusiasts' machines. The RAM memory portion at 128Kb seems to be becoming a standard minimum to support the sophisticated windowing applications software packages available.

Mass memory storage in the form of floppy and hard disks have long since replaced the audio cassette in the home marketplace because of their rapid random access capabilities. Electronic replacements, such as bubble memory and EEPROM chips, have seen sluggish market acceptance. The latter is caused mainly by the lack of adequate density.

All in all, every mass storage technology is advancing rapidly, each one trying to outdo the other. Be prepared, because the video disk is breaking into this corner of the marketplace with its gigabit storage capacities!

Communications between users, other computers and large information databases is precipitating a change that renders the modem an absolute necessity for a basic system.

You've seen recent releases, such as the Radio Shack Model 100, that boast built-in communications hardware and software. These all-in-one micro systems are utilizing single-chip LSI modem components, some with autodial capability.

The days of the extra box with foam-lined cups to retain a telephone handset are fast becoming memories. Direct connection to telephone lines uncomplicates the hook-up for a majority of today's unsophisticated users. With AT&T breaking up, the standard handset that used to fit the acoustic coupler is also fading away and being replaced by lightweight space-age "function sets."

Traveling through the diagram leaves us with only one other aspect to explore: the man-machine interface. Keyboards and displays are the user's entry way to a system. A majority of users today do not go beyond these devices. Opening the cover voids the warranty; besides, there are "no user adjustments" inside anyway.

Therefore, the designers of today's systems must be willing to make a statement about their creation using just this interface. It is the use of different input and display technologies that distinguishes between the desktop, the transportable and the truly portable computer.

Terminal Technology

That last paragraph deserves further explanation. Desktop micro systems traditionally have been housed in rigid structural foam or metal cabinets. They utilize the CRT method of displaying information and typically boast full-travel alphanumeric keyboards that contain anywhere from 53 to 126 ¾-inch keytops. All of this adds up to one large package. Although today's desktop systems are miniature compared to yesteryear's, they are a far cry from briefcase portables.

Throughout the late 1970s and early 1980s, several companies, mostly small, experimented with the same desktop components, yet they utilized new

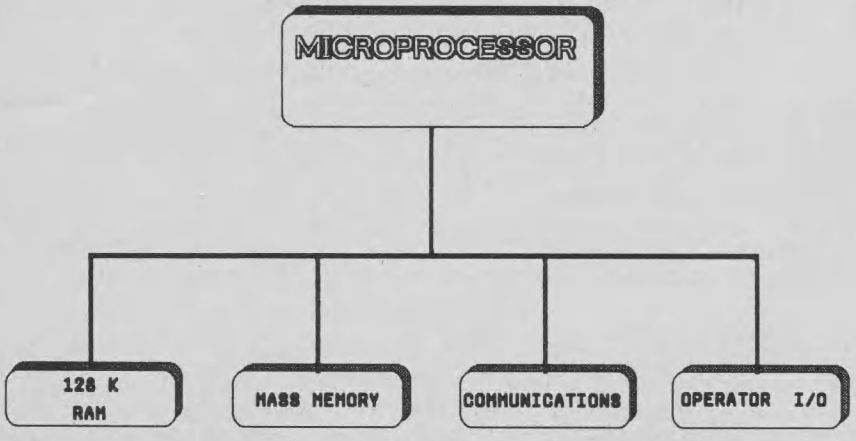


Fig. 1. Basic functional block diagram of a typical microcomputer system.

Mark Robillard is a principal Engineer/Program Manager for Sanders/Calcomp in Hudson, NH. He can be contacted at MJR Digital, PO Box 630, Townsend, MA 01469.

packaging concepts. The one that caught on as a customer-acceptable unit was the Osborne system.

To keep the size down, Osborne opted for a five-inch CRT, which became a critical negative comparison item when put beside competitive units. Since that time, this type of transportable has reverted back to a nine-inch tube, which has proven to be effective.

Other display technologies have entered the market, but none is as well-represented as the newer-generation LCD panels that are popping up in all of the kneetop compatibles. It is no longer a rarity to see multiple-line 80-character panels that support full bit-addressable graphics. The low-power characteristics and relative thinness of the LCD has helped its rise to stardom. Industry is forging ahead on larger panels; the ultimate goal is to replace the CRT in the alphanumeric terminal market.

Data entry has changed little over the years. We still use the QWERTY keyboard as the main user interface. Joysticks have been recently replaced by the mouse and data tablet for precise cursor positioning.

Entry devices for portable systems tend to compromise on comfort in the name of cost effectiveness and lightweight packaging. The chiclet keyboard, where the tops are barely movable, is one such compromise. Some of the newer units are even building in touch-sensitive mouse-like panels to cut down on extra peripheral hardware. The bottom line on all portable systems is low cost.

You didn't read this article to hear the same market-type mumbo-jumbo that you're getting in the business pages of your local paper, and it's not the purpose of this discussion to bore you with that. It is, however, important to get a perspective on where this market came from and how it is emerging if you're interested in the systems aspects of the units.

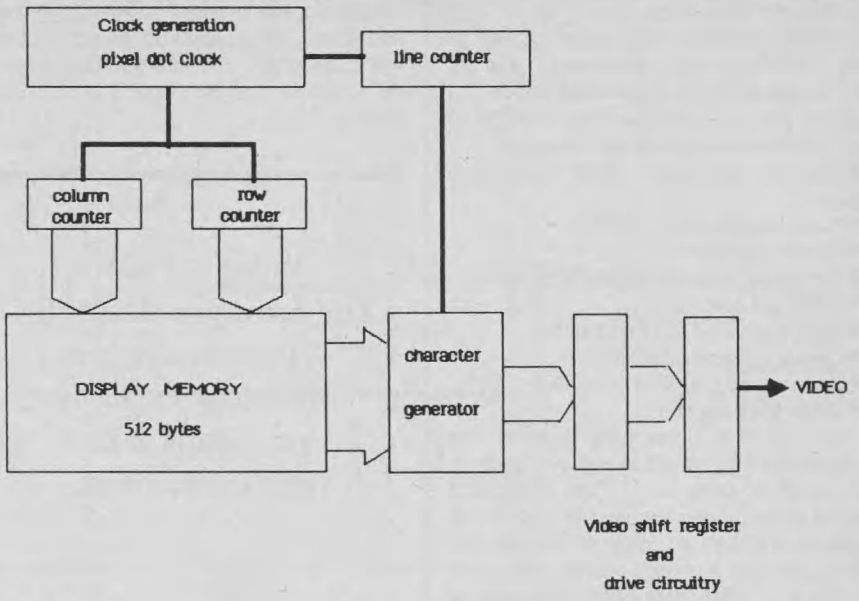


Fig. 2. Block diagram of simple video terminal that displays a format of 16 lines of 32 characters.

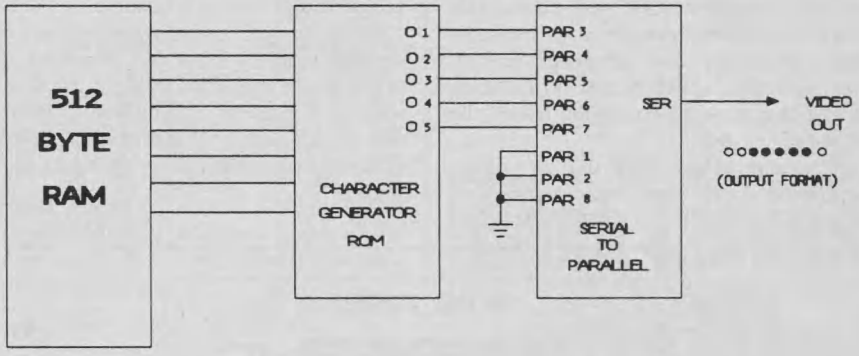


Fig. 3. Character memory organization of 32 × 16 display.

Display History

As I mentioned earlier, display and keyboard types make the difference in portable systems. A review of the past history of character video generation will prepare you for the treat I have in store.

If you recall, it wasn't all that long ago when a display of 16 lines of 32 characters was the popular configuration. It was implemented using many counters and other small-scale integrated circuits. A block diagram of a typical terminal video board is shown in Fig. 2.

You can see from the figure that the counters are divided between characters and rows. A master clock generator keeps the counters synchronous. Characters are created by a series of dots, usually five wide by seven high.

The character dot patterns are contained in the character generator ROM. The output of this ROM is five bits wide. All bits are fed to a parallel-to-serial shift register and then transmitted to a monitor one bit at a time. Most shift registers are eight bits wide.

Therefore, several of the parallel inputs to the register are hard-wired to provide intercharacter spaces. Usually, the first two bits are wired low and the last bit is wired the same. This will frame the five bits of true character output with two-bit spaces to the left and one to the right, resulting in three-bit spaces between characters.

In these historical circuits, only 512 bytes were required to store a full page of text. Each character was stored as a seven-bit ASCII code. The output of the memory chips was fed directly into the character generator (Fig. 3). A microprocessor wanting to address this memory would have to be isolated through a complex dual-port arbitration circuit.

Gradually, we have simplified the display interface. The early LSI CRT controllers (Intel 8275, SMC 5027) reduced board real estate from nearly 200 ICs for an 80 × 24 format display down to under 20. Further products from Motorola and National (MC6845, DP 8350) formed a second-generation product family. The National 8350 part sharply reduced the real estate to approximately six ICs.

Over the past two years, terminals that have the capability of producing bit-addressable graphics have become available. Now everybody wants one! NEC introduced the 7220 graphics processor IC, which was revolutionary in reducing graphics architecture. In a future "Techniques," we'll explore the 7220 and all of its modes. In 1984, another revolutionary display product will emerge and, you guessed it, we are going to uncover it.

National Semiconductor NS 455 TMP

When I started this article, I mentioned how portable systems were constrained by user I/O configuration. The National

TMP product will begin to alter the truthfulness of that statement.

What is a TMP? The acronym stands for "Terminal Micro Processor," and by no means is its title misleading. Inside this 48-pin package (yes, hackers, it's time to get different sockets) is the following:

- Eight-bit enhanced 8048 microcomputer
- Fully independent UART
- Bit rate generator
- Keyboard interface (eight-bit parallel)
- Interrupt controller
- Programmable CRT controller
- Character generator ROM
- Bit-mapped graphics controller
- Video shift register

No, you're not dreaming! It really has happened. The time has come to where a terminal is on a chip. This article will serve to introduce the part to you. A follow-up article in a couple of months will present schematics and boards utilizing it.

Fig. 4 is a functional block diagram of the TMP. As we explore each block, I'll describe the functions in more detail and go over the specifications of the part. The microcomputer, as I said, is based on the 8048 family of products.

Most of the instructions have remained intact; however, several new commands have been added to service the communications, display and interrupt mechanisms. There is 2Kb of control ROM on board that may be expanded externally for a total of 8Kb.

A version of the TMP that is preprogrammed to emulate an enhanced alphanumeric graphics terminal is being developed. For those of you who are contemplating designing this in where you work, there will be evaluation boards and development system support in the near future.

What is TMP? The acronym stands for "Terminal Micro Processor," and by no means is its title misleading.

Display memory resides off-chip and may be an entire 65,536 bytes deep. On board the TMP is a memory controller that takes care of addressing external memory devices. The TMP has the ability to scroll both vertically and horizontally through display memory.

Individual text windows that can be scrolled independently can be set up. All of this is accomplished through the use of a series of registers. To give you an idea of the configurability of the display memory, scan through the descriptions of each register:

- Home Address Register—Points to the first location of display memory that appears on the screen.
- Current Row Start Register—Points to the first location of the current row in display memory.
- Status Row Register—Points to the first location of the status row in the display memory.
- Beginning of Display RAM Register—First location of display memory.
- End of Display RAM Register—Points to the last location (plus one) of display memory.
- Cursor Address Register—Points to the current cursor location in display memory.

By manipulating each one of these 16-bit registers, text on the screen may be scrolled, panned and so forth.

Abilities and Attributes

Speaking of text, the TMP has the ability to display characters that are six to ten dots in width and up to 16 scan lines in height. A total of 128 characters may be painted horizontally by 32 rows in depth. The internal character generator supports a full 128 character codes. The preprogrammed part is set up to display a 7 × 9 matrix for each code.

Each character may contain one of seven attributes. It's possible to display characters in reverse video, at half intensity, blinking, double height, double width, underlined or simply blanked.

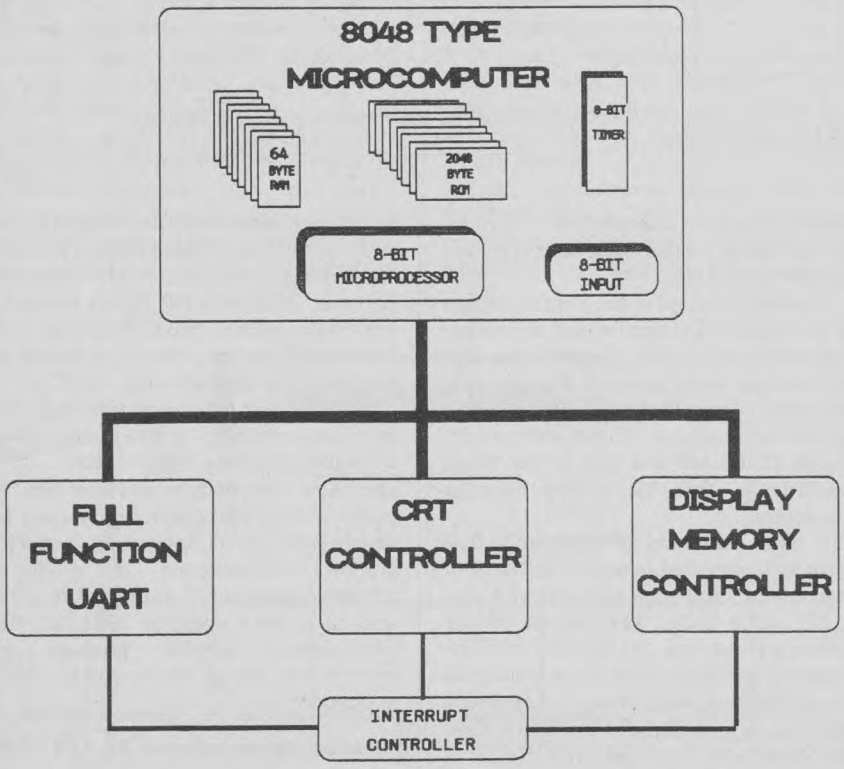


Fig. 4. Functional block diagram of National Semiconductor's TMP.

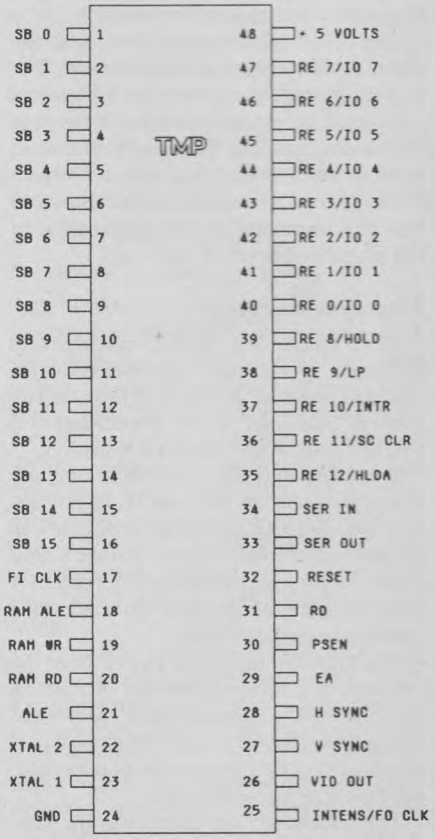


Fig. 5. Pin-out of TMP package.

Another attribute is the graphics mode. In this mode, a full 640 horizontal pixels by 325 vertical pixels may be plotted on the screen. You can mix text with graphics in all displays; however, a text character will take the place of background graphics because each entity occupies the same display memory location.

Communication between the operator and the TMP is accomplished through two ports. One of these is an eight-bit parallel input device that could be connected to an encoded keyboard. The TMP can be programmed to take a character received at this port and place it somewhere in display memory. The CRT portion of the device will automatically perform the display action.

The other communications device present is a full-functioning UART. I describe it this way because some single-chip microcomputers include so-called UARTs that are really only parallel-to-serial and serial-to-parallel shift registers. The device in the TMP is just as complex as the standard UARTs on the market today. When a character is received, it can interrupt the microcomputer much the same as the parallel port.

An internal bit rate generator can be programmed to support 13 serial communications rates from 110 to 19.2K bits per second. All you have to do is connect appropriate-level shifting components to the outside of the chip to have a full duplex communications capability. Today's single-chip modem parts fit well with the TMP to extend its abilities to talk to the world.

System Hook-Up

Looking at the outside of the TMP, let's explore the functions of each pin. Fig. 5 depicts the pin designations and assignment of the TMP.

Pins 1–16 are known as the System Bus. Through these 16 lines, display memory addresses, which are used to retrieve characters for display or to address locations that are to be written to, are output. Pin 17 is an external FIFO clock input. Internally, there is a small memory that is arranged as a first-in-first-out (FIFO) stack where attributes are entered. You can extend the attribute memory by clocking data in from an external FIFO.

The next three pins (18, 19 and 20) are display memory control lines. Pin 18 is used to latch display memory addresses. Pins 20 (RD) and 19 (WR) are utilized as Read and Write controls to that memory. As I mentioned earlier, program memory may be expanded to 8Kb off-chip.

Pin 21 acts as the address latch enable for addresses output to this memory. Used in conjunction with the ROM external bus (pins 38–47), any memory connected here may contain a control program for the microprocessor inside the TMP.

Communication in the form of eight parallel bits enters the chip through the same pins used for ROM addresses. Serial I/O is applied to pins 34 (SI) and 35 (SO).

Other significant pins are the vertical sync output (pin 27), horizontal sync (pin 28) and, finally, the video output (pin 26). Fig. 6 shows the TMP connected in a typical system fashion. The part has the capability of addressing 64Kb dynamic RAMs through the use of two multiplexer ICs.

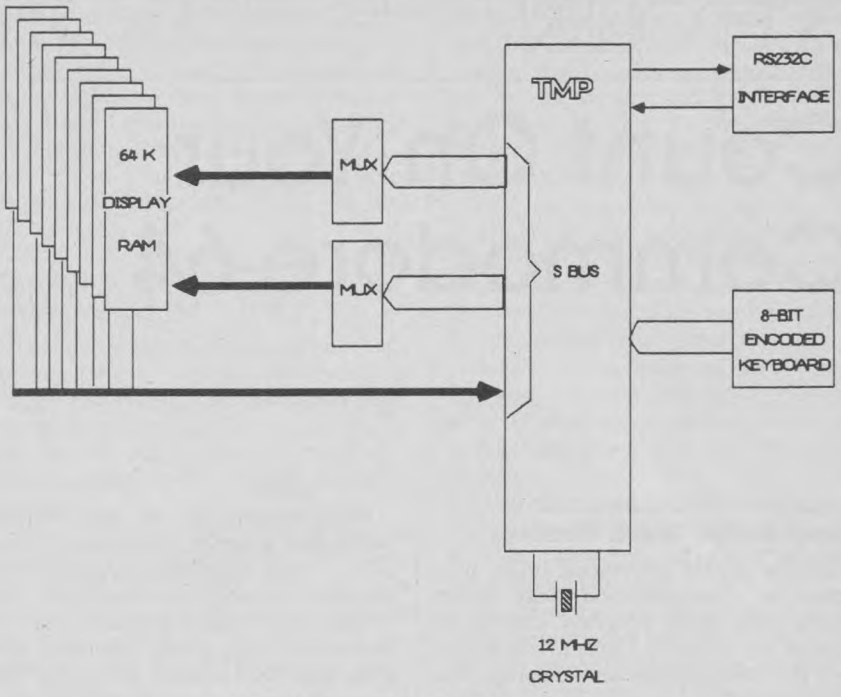


Fig. 6. Typical system connection.

Wrap-Up

As you can see from this teaser, portable systems are getting more compact. The data available on the TMP was sketchy at the time of this writing; as I said before, I promise a full article and construction project using this part within the next few months.

Next month I'd like to focus on another component that is making the job of portable systems designers easier. Single-chip modems are the subject, and one in particular will surprise you with its ease of use. I'll show construction details on this one.

I'd like to hear from you if there is some technique, device or any other subject you'd like to see covered here. If it's something I already know about, you'll see it within a few months; otherwise, I'll make it a point to investigate it and report back as soon as possible.

Those of you who have written to me previously have been supportive, and I apologize for the delay in personal answers. I try to get to every letter.

A special note of thanks for info on TMP goes to Dan Hagerty and Bill Kofed of National Semiconductor and Pat Potter of A/D Systems.□

Back Issues



January 1980 to June 1980 . . . . . $3.00
July 1980 to May 1983 . . . . . $3.50
June 1983 to present $4.50

Add $1.00 per magazine for shipping. 10 or more magazines add $7.50 per order for shipping.

Free Back Issue Catalogue available. Includes listings of article titles and a brief description of subjects covered in each issue.

Write for your copy today!

80micro®
Back Issue Order Dept.
80 Pine Street
Peterborough, NH 03458

By Robert W. Baker

Count On Your Commodore-64

Here's a Handy Utility for Easy Script Users.

Easy Script Word Counter

Here's another interesting utility program for Commodore-64 Easy Script users. This short program (Listing 1) counts the words in a given Easy Script text file. The program isn't foolproof, but it's accurate.

When you run the program, it asks for the filename of the desired file. Then it requests the minimum number of letters a word must have to be counted. For example, you might choose to count only those words with four or more letters and skip shorter words. If you're doing school papers, writing classified ads and so on, you may find this handy.

When reading the file and counting words, the program automatically skips over all Easy Script commands and any nonalphanumeric characters in the text. Words with hyphens or apostrophes are counted as single words, since any character that's not a letter or number isn't counted as part of the word. Groups of numbers are also considered to be words. Whenever a space, shifted space or return (shown as a back-arrow in Easy Script) is found, it's considered to be the end of the word.

The program flow is simple. Lines 180–260 do all the initialization. Lines 330-390 read and check each character in the file. When a letter or number is found by lines 360–380, then line 320 increments the letter count (L) for the current word. If you want to ignore numbers while counting words, you can delete line 380.

Line 390 checks for a space, shifted space or return as the end of the word; any other character is ignored. At the end of the word, line 410 checks whether the word is equal to or longer than the minimum word size specified before incrementing the word count (W).

When the end of the file is found, the number of words counted is displayed on the screen. With longer files this program may take a little while to execute due to the slow access time of the VIC-1541 disk; be patient. The only thing currently missing is the ability to handle global Easy Script files. If you want to count all the words in a long piece, simply count each file separately.

```
100 REM ******************************
110 REM
120 REM    EASY SCRIPT WORD COUNTER
130 REM
140 REM      BY: ROBERT W. BAKER
150 REM
160 REM ******************************
170 :
180 PRINT"□-----  EASY SCRIPT WORD COUNTER  -----":PRINT:PRINT
190 PRINT"THIS PROGRAM ATTEMPTS TO COUNT THE"
200 PRINT"NUMBER OF WORDS IN A GIVEN EASY SCRIPT"
210 PRINT"TEXT, SKIPPING EASY SCRIPT COMMANDS.":PRINT
220 PRINT"----------------------------------------":PRINT
230 INPUT"FILENAME";F$: F$=LEFT$(F$,16)
240 INPUT"MIN # LETTERS/WORD   1■■■";M$: M=VAL(M$)
250 IF M<1 THEN 240
260 OPEN 15,8,15: W=0: L=0: PRINT
270 OPEN 8,8,8,"0:"+F$+",S,R" : INPUT#15,EN
280 IF EN>0 THEN PRINT"FILE NOT FOUND!": GOTO 550
290 PRINT"OK, READING FILE...":PRINT
300 GOTO 330
310 REM READ FILE BYTE-BY-BYTE
320 L=L+1
330 GET#8,C$: IF ST<>0 THEN 500
340 C=ASC(C$): IF C=128 THEN 440
350 REM CHK CHAR
360 IF (C>193 AND C<220) THEN 320: REM CAPITAL A-Z
370 IF (C>64 AND C<91) THEN 320: REM SMALL A-Z
380 IF (C>47 AND C<58) THEN 320: REM NUMBERS 0-9
390 IF C<>32 AND C<>96 AND C<>13 THEN 330: REM SPACE OR RETURN
400 REM END OF WORD
410 IF L>=M THEN W=W+1
420 L=0: GOTO 330
430 REM EASY SCRIPT CONTROL LINE
440 GET#8,C$: IF ST<>0 THEN 500
450 C=ASC(C$): IF C<>42 THEN 420: REM * AT START OF COMMAND
460 GET#8,C$: IF ST<>0 THEN 500
470 C=ASC(C$): IF C<>13 THEN 460: DISCARD UNTIL RETURN
480 GOTO 330
490 REM END OR ERROR
500 IF ST<>64 THEN 530
510 IF L>=M THEN W=W+1
520 PRINT W;"WORDS": PRINT:PRINT"( WITH";M;"OR MORE CHARACTERS )": GOTO 550
530 INPUT#15,EN,EM$,ET,ES
540 PRINT"DISK ERROR": PRINT EN,EM$: PRINT ET,ES
550 CLOSE 8: CLOSE 15: PRINT
READY.
```

Listing 1. A utility to count the words in an Easy Script text file.

Screen Print Utility

Here's a short machine language screen print utility for the Commodore-64 from the PET Benelux Exchange. Loading and running the Basic program shown (Listing 2) will load the required machine language code into memory. Once loaded, type SYS 50000 to get a hard copy of the Commodore-64 screen contents.

Beach-Head

Beach-Head is a new multi-screen action game for the Commodore-64 from Access Software (925 East 900 South, Salt Lake City, UT 84105). Beach-Head requires different skills and provides new sequences as you progress through the game.

You'll encounter secret passages, squadrons of enemy planes, shelling from enemy ships, an almost impenetrable enemy-held beach and a fortress with a huge cannon that never misses. It's one

Address correspondence to Robert Baker, 15 Windsor Drive, Atco, NJ 08004.

of the most challenging games I've played on the Commodore-64.

The game starts with an aerial reconnaissance overview of enemy-held coastal territory. You can take your fleet of ten ships through the hidden passage and gain the element of surprise or take the enemy head-on. The hidden passage is extremely difficult to navigate through because it's mined and torpedoes are launched at random throughout the channel.

Once you reach the enemy fleet, general quarters are sounded and enemy fighter squadrons attack your fleet. Your joystick controls your anti-aircraft guns as you try to shoot down enemy planes. Enemy surveillance aircraft occasionally fly by. They are worth additional bonus points if destroyed.

If you survive the onslaught of enemy aircraft, the naval battle begins. The enemy battleships and cruisers shell your fleet. Your joystick is now used to fire your heavy guns in an attempt to sink the enemy ships.

Each time your guns are fired, the display will indicate your distance (short or long) from the target. If you sink the enemy aircraft carrier before it escapes, you score an additional 10,000 point bonus.

After the naval battle, you must maneuver your remaining ships into the enemy harbor and land your tanks to establish a beachhead. You then fight your way through the island defense systems to get to a fortress. On the way, your tank can move only from side to side; there's no turning back.

When you reach the fortress, you must land ten shells in the fortress to destroy it. There are ten targets to hit, but only one is vulnerable at a time. The fortress is defended by a high cannon that never misses once you've been sighted, so you must act quickly. If you're successful in destroying the fortress, the enemy surrenders and victory is yours!

Beach-Head offers four levels of difficulty for one or two players. You can fine tune the sound to match your particular computer and obtain maximum sound quality. A pause feature stops all action when you need a break.

The self-play mode automatically starts whenever the game is left unattended for a short time. You can, however, gain complete control by simply moving the joystick.

At any time you can abort the current game and start over. A record of the top ten scores is maintained.

The game is written entirely in machine language and makes extensive use of superb three-dimensional, high-resolution graphics. I just can't say enough about the graphics and sound effects. The game itself comes on a copy-protected disk and takes several minutes to load. It uses a single joystick for control with good response to your every command.

Beach-Head is a super game and is extremely difficult to master at higher levels. My son and I have been playing for several days without getting past the naval battle. By taking control of the self-play mode, I was able to cheat a little and try navigating the tanks and attacking the fortress. The game gets more challenging as you progress—one slip and you're dead.

EasyQuiz 64 and EasyLesson 64

This two-program package from Commodore for the C-64 provides complete test generation and administration capabilities for the average teacher. EasyLesson 64 lets you create, save, edit and print questions on any subject or area of interest.

This ability lets you create a pool of questions from which you can generate a test or quiz. You can then create multiple copies of the test on paper or create an electronic test that the computer can administer using the accompanying EasyQuiz 64 program.

EasyLesson 64 is menu-driven, while EasyQuiz is fully prompting for ease of use. Both programs will run on any Commodore computer with at least 32Kb of memory even though they are designed for the C-64.

You can use the datassette tape recorder or any Commodore disk drive to record the questions and answers you create. Printed output can be generated using any Commodore printer.

EasyLesson 64 prompts for the date, the author's name and the lesson name. This information is included whenever lessons are displayed or printed.

You can define up to seven categories for each lesson with each question associated with at least one category. These categories are used to separate questions into sets for the later creation of an EasyQuiz or the printing of a test. The actual category description can be up to 26 characters long.

To create a question, you can enter up to five lines of text with up to 38 characters per line. You can also enter a reference of up to 33 characters in length. This may be a hint to the answer or to the location of associated material.

Answers to the question are in a multiple-choice format with up to five possible answers. Each answer can be up to 33 characters long or can be omitted entirely.

EasyLesson 64 expects the first answer input to be the correct answer. This answer is mandatory as every question must have an answer.

As mentioned earlier, every question must be put into a category. After selecting the category, the program asks you to accept the question as entered and displayed. When an "N" reply is entered, you'll be reprompted for each text line and the answer of the question, which allows you to make corrections. A "Y" response enters the question.

When generating an EasyQuiz, you can select questions from the lesson by category. The lesson categories are displayed and you're prompted to select one, some or all of the categories listed.

After selecting the desired categories, the program indicates how many suitable questions exist for those categories. After selecting the number of questions for the quiz, you're prompted for a quiz

```
100 REM ****************************
110 REM
120 REM   SCREEN HARDCOPY PROGRAM
130 REM
140 REM USE SYS 50000 AFTER LOADING
150 REM TO GENERATE HARD COPY.
160 REM
170 REM ****************************
180 :
190 FOR X=0 TO 94: READ D: POKE 50000+X,D: NEXT X
200 :
210 DATA 169,4,133,186,169,126,133,184
220 DATA 169,0,160,4,133,113,132,114,133
230 DATA 183,133,185,32,192,255,166,184
240 DATA 32,201,255,162,25,169,13,32,210
250 DATA 255,32,225,255,240,46,160,0,177
260 DATA 113,133,183,41,63,6,183,36,183
270 DATA 16,2,9,128,112,2,9,64,32,210
280 DATA 255,200,192,40,208,230,152,24,101
290 DATA 113,133,113,144,2,230,114,202
300 DATA 208,205,169,13,32,210,255,32,204
310 DATA 255,162,126,76,195,255,96
READY.
```

Listing 2. A machine language utility to get a hard copy of the C-64 screen contents.

BOOKS

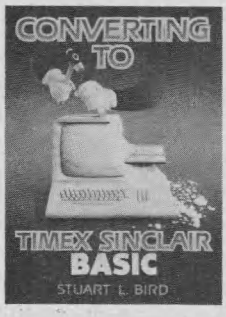
Wayne Green Books

BOOKS



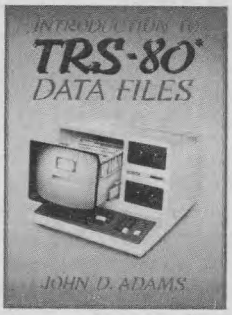
Rainbow Quest for the Color Computer

A computer fantasy for young Color Computer users. Rainbow Quest *is an adventure that combines fiction and programs. Readers must cross the planet Rainbow and master a series of challenges to succeed on the Quest. Each challenge is a program on cassette. Included are arcade games, puzzles, and mazes. Book and cassette sold together.* **$24.97 BK7391 128 pp.**



Converting to Timex/ Sinclair BASIC

Convert programs to run on your T/S 1000 or 1500. This is a guide to translating from other BASICs into Sinclair BASIC. Fifteen types of instructions are covered. The T/S replacement is given for each, followed by a description of its use and an example. Much of the material applies to the T/S 2068. **$14.95 BK7396 206 pp.**



Introduction to TRS-80 Data Files

Learn by doing with this guide to writing a data base manager. This book, with its accompanying software, takes you through a simple, mailing list program to teach you about sequential and then random access files. The construction of a DBM and the techniques for moving data to and from disks are discussed. **Book and TRS-80 disk** *$24.97 BK7398 approx. 144 pp.*



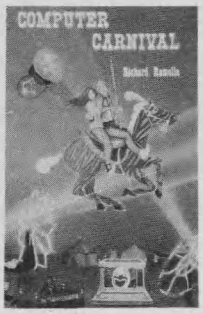
Inside Your Computer

Find out what goes on inside your machine. Inside Your Computer *explains microcomputer circuits and how they work. Topics include chips, interpreters, circuits, machine language, binary numbers, algorithms, ASCII code, software, and what they all mean to the computer. Includes many photographs and schematics.* **$12.97 BK7390 108 pp.**



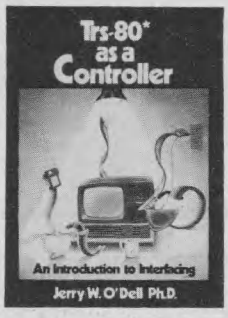
TEXTEDIT

Build your own word processor with the TEXTEDIT kit. This TRS-80 Disk BASIC system is built in modules, so you can modify them or use only the parts you need. Features include complete editing, search, replace, and count, and upper/lowercase typing on an unmodified Model I. Model III users need the TRSDOS CONVERT utility to use the disk. TEXTEDIT is compatible with any major DOS. It operates with one drive; two drives or copy utility needed to transfer programs to system disk. **Book and disk package $24.97 CC7387**



Computer Carnival

For the TRS-80 Models I and III. These sixty programs for beginners will entertain and educate. Children will find mazes, word games, graphics, puzzles, and quizzes. Card games, logic tests, word and number quizzes, and letter guesses make Computer Carnival *a learning experience. The* Carnival Companion *cassette of all sixty programs is also available.* **Computer Carnival and Carnival Companion** *$24.97 CC7389* **Computer Carnival** *$16.97 BK7389 218 pp.* **Carnival Companion** *$9.97 TP7389*



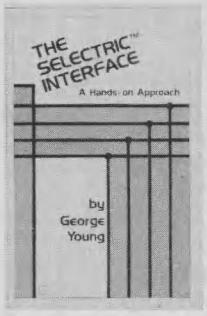
TRS-80 as a Controller

Learn to control outside devices with a TRS-80. This book is an introduction to interfacing, with simple, inexpensive projects. Applications include controlling lights and switches, building a small computer, and suggestions for more complex applications. The book applies to the Model III and, with minor conversions, the Model I. **$12.97 BK7394 192 pp.**



Annotated BASIC, vols. 1 and 2

This two-volume set teaches you the hows and whys of BASIC programming. TRS-80 Level II programs are taken apart and described in detail. Each program is accompanied by documentation, program annotation, BASIC concepts and definitions, and a flowchart.
Vol. 1 *$10.95 BK7384 160 pp.*
Vol. 2 *$10.95 BK7385 125 pp.*



The Selectric™ Interface

You can turn an IBM Selectric I/O writer into a letter-quality printer for your computer. The Selectric Interface *gives you the programs and step-by-step instructions you need for Selectric models 2740, 2980, and Dura 1041. With slight modifications, the instructions will work for various chips.* **$12.97 BK7388 124 pp.**



TRS-80/Z80 Assembly Language Library

Learn to use assembly language on the Model I to its full capacity. Two TRSDOS-compatible disks are included, with programs worth many times the book's cost. You'll learn about TRS-80 hardware and software, general Z80 routines, and TRS-80 utility programs. Examples show you how to apply the information to your everyday programming. Model III conversions are given.
$34.97 BK7395 355 pp.
Disks included.

40 Computer Games from Kilobaud Microcomputing

Accept the challenge of some of the best games Kilobaud *has published. This collection has everything from racing games and gambling to space adventures and calculator games for a variety of systems. Conversion instructions are given.* **$7.95 BK7381 148 pp.**

Some of the Best from Kilobaud Microcomputing

Get the programs for your PET or TRS-80 that readers chose as their favorites. Chapters include detailed programming techniques, reviews, building and interfacing, peripherals, and file structures. Applications include word processors, data base managers, and text formatters. **$10.95 BK7311 223 pp.**

Kilobaud Klassroom

Learn electronics with this hands-on course. This collection of electronics projects starts with simple concepts and takes you on to building your own small computer. You'll learn electronics theory and get the practice you need to master digital electronics. **$14.95 BK7386 393 pp.**

For credit card orders, call **toll-free, 1-800-258-5473.** Or send your order on a separate piece of paper to: **Wayne Green Books, Retail Sales, Peterborough, NH 03458.** Be sure to include the book title, order number, and price. Postage and handling is $1.50 for the first book, $1.00 for each additional book. Foreign air mail is $10.00 per book. Check, money order, or complete credit card information must accompany order. If you have questions about your order, write customer service at the above address.

Circle 367 on Reader Service card.

name that can't be longer than five characters. The entire quiz is written on disk or tape under your chosen quiz name.

Printed tests are generated in much the same manner by selecting the categories and questions to be printed plus the test name. One other option allows you to print the questions with multiple-choice answers, or you can print just a line of dashes to allow write-in answers. After the test is printed, a single copy of the answers is printed in the same sequence as the questions.

The EasyQuiz program prompts for your name and allows use of sound if desired. After entering the name of the quiz to be taken, the program responds with the name of the EasyLesson, the date it was created, the author and how many questions are in the test. When you're ready to take the quiz, there's an option to scramble the order of the questions or take them in the order they were created.

Multiple choice answers are placed in random order when displayed. At the completion of the test, the program indicates the total number of questions, the number right and the time used to complete the quiz. After completing one quiz, you can try it again or restart the program and try a different quiz.

These programs are easy to use and include concise documentation with enough information to get you started. They provide powerful testing capabilities but don't supply or maintain any grading information linked to specific students.

Security may be a problem—the programs can be stopped using the Run/Stop key and data is not encrypted or protected. As such, the ability to generate a printed quiz where students don't have access to the lessons on disk or tape would be most desirable.

Quickies

The Comal Users Group (USA) recently announced the availability of the Comal language for the Commodore-64 on disk.

Comal is designed to replace Basic and includes 40 graphics statements and commands, 11 sprite statements and turtle graphics.

It comes with a run-time compiler that explains why it is so much faster than Basic. String searches are said to be more than 79 times faster—typical program execution should be about six times faster.

It's easy to program in Comal because it includes virtually every Basic keyword as well as program structures popularized by Pascal. When Comal lists a program, these structures are automatically indented for added clarity.

Variable names can be up to 16 characters long, with all characters significant. Procedures and functions are named and can be multiline.

Programming errors are caught as you enter the line with understandable error messages. The cursor is placed on the line at the point of error. The nondestructive error message is removed from the screen after you correct the error, and the previous screen line is replaced.

Comal lets you store program segments on disk; these can be merged into another program later on. Automatic line numbering and line renumbering is standard, as is end-of-data and end-of-file detection. The function keys are used to switch from a graphics screen to a text screen and back again.

A simple statement can be used to disable or enable the stop key. Finally, Comal can read data files created by Basic with no conversions needed.

Besides all the fun, easy-to-use commands introduced in Vanilla Pilot, Pilot II adds Pilot features you've been looking for.

A copy of this powerful language costs $19.95. The disk includes many sample programs. Copies of the *Comal Handbook* are also available at $18.95, plus $2.00 shipping and handling. For more information send a SASE to the Comal Users Group, 5501 Groveland Terrace, Madison, WI 53716.

Pilot II

Tamarack Software, authors of Vanilla Pilot, recently announced an advanced Pilot language for the Commodore-64 called Pilot II.

Besides all the fun, easy-to-use commands introduced in Vanilla Pilot, Pilot II adds all the Pilot features you've been looking for. This program includes file-handling capabilities, both high- and low-resolution turtle graphics, a unique sprite editor and access to all the color and sound capabilities of the C-64 without any peeks or pokes.

Pilot II is a superset of the Pilot language containing all the standard Pilot commands and more. Now there are 25 easy editing commands, 19 turtle graphics commands and 23 program commands with many more subcommands and options.

Pilot II gives you three graphics options—lo-res turtle, hi-res turtle and sprites. In fact, it's the only Pilot language available with true turtle graphics in hi-res for the C-64.

With Pilot II you can easily go between hi- and lo-res graphics and even use characters on the hi-res screen. You can see the sprite you're designing and edit while using this full-featured sprite editor. Easy-to-use commands allow integrating the sprite into your Pilot program.

A student command allows teachers to design lessons and tests without students having access to answers. The built-in timer, counting in tenths of a second up to 54 minutes, is another convenience that teachers will appreciate. A File command stores data files on disk and sends output to a printer, voice synthesizer or other peripherals.

The Programmers Aid package contains all the editor commands found in Vanilla Pilot—including Find, Change, Trace, Renumber and Auto. You'll even find commands for saving to or loading from disk. Several new editing commands like Sprite, Student and BLoad (a machine code loader) have been added for increased flexibility.

Other commands allow the use of joysticks, light pens and paddles. A number of analog devices can also be accessed using the paddle option.

The Pilot II user's manual is a friendly guide designed to lead beginners as well as experienced programmers into full use of the Commodore-64. It has an index to keep all those powerful commands at your fingertips and many examples to make programming easy and fun.

Pilot II for the Commodore-64 is supplied on disk with a suggested price of $49.95. You should be able to find copies through your local Commodore dealer or software outlet. For more information you can write Tamarack Software, PO Box 247, Darby, MT 59829.

New Games

Sirius Software (10364 Rockingham Drive, Sacramento, CA 95827) announced two more products for the Commodore-64, Wavy Navy and Critical Mass. Wavy Navy sells for $34.95 on disk and offers a raging battle on the high seas with amusing graphics and maritime music.

One to four players can work their way from galley slave to president in ten increasingly complex rounds. High-rolling waves force you to continuously change positions, exposing yourself to mines in the water as well as enemies in the air. Previous Apple and Atari versions were top-sellers with terrific press ratings.

Critical Mass an is animated adventure game featuring colorful graphics, music, challenging action sequences and a devious plot. The adventure is literally a race against time to save the world from a madman determined to blow it to pieces. A built-in time clock adds problem-solving dimensions to Critical Mass as the player deals with plane schedules, business hours and international time zones. This program lists for $39.95 on disk.□

Kaypro Joins the PC Crowd

Thanks to SWP Microcomputer Products' Co-Power 88, the Kaypro II and 4 are capable of running some of the countless software programs for the IBM PC.

By Thomas Howe

Kaypro has just entered the PC-compatible field in an innovative way. With a little help from SWP Microcomputer Products of Arlington, TX, it has introduced a coprocessor board, the Co-Power 88, and operating systems that allow the Kaypro II or 4 to run some IBM PC software.

For those of you who have never heard of a coprocessor, it is a device that gives you two computers in one. For the Kaypro, this means an addition of an 8088 microprocessor, which performs functions that aren't possible with a standard Z80.

Let me make it simple. When you bought your Kaypro, it didn't even come close to an IBM. It just wasn't in the same league. For a little money, you got a good computer that could do a lot of nice things—except run with the most popular crowd, IBM.

Now you can upgrade your Kaypro (or buy one already doctored) to do some things faster than any PC can do. The nice thing is you can do it for much less money.

This machine is available two ways. If you already own a Kaypro II or 4, you can buy this board with 256Kb of memory and install it yourself. If you're still looking for a computer, Kaypro promises the complete Kaypro II Plus 88 for under $2000. What a deal! There is no word of a similar upgrade for the Kaypro 10 yet, although I suspect there may be one in the works.

The basic advantage of this board is that you can run either your normal eight-bit CP/M software as usual or use some IBM-type software. Kaypro and SWP claim that dBaseII and WordStar run fine.

Additionally, the board is supposed to function as a RAM disk in its eight-bit mode, which effectively gives you a third drive. Let's see just what this new toy can and cannot do.

The Tinkering Department

If you already own a Kaypro II or 4 and want to upgrade to IBM compatibility, it's fairly easy if you can afford the extra board. Purchased directly from SWP Microcomputer Products, the 256Kb board with both CP/M-86 and MS DOS operating systems lists for $699. I suspect it may be available from Kaypro for much less. Once you've paid the price, installation is simple.

If you aren't too sure of your abilities in the tinkering department, you should have your dealer install your board. SWP has a disclaimer at the beginning of the installation instructions telling you to have a qualified technician install the board. This isn't a bad idea because you can also enhance your chances of maintaining the warranty.

You may be able to do it yourself in about 30 minutes if you have some electronics skills. A minimum of soldering is necessary because there are only two connections to solder. Everything else plugs in and is almost foolproof.

The instructions are simple and sufficiently detailed. You should refer to the photographs as you read to see how the job is done. Then, if your dealer advises you to do so, go

Address correspondence to Thomas Howe, 255 Flamingo Road, Mill Valley, CA 94941.

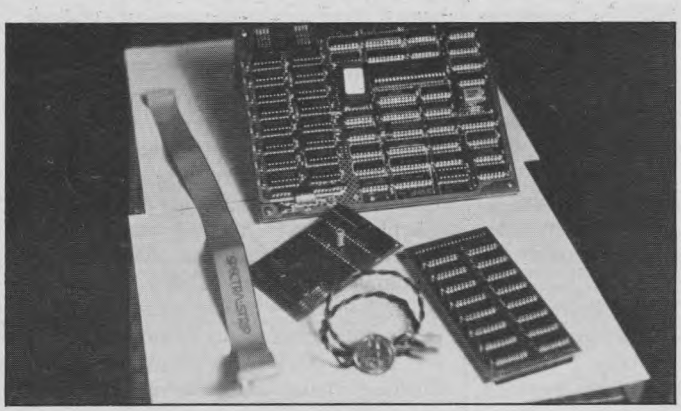


Photo 1. Contents of the Co-Power 88 kit.

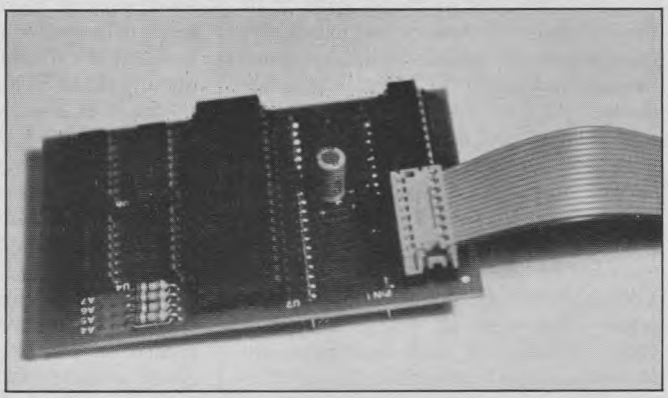


Photo 2. Adapter board from Co-Power 88 kit.

ahead and try it. Just be sure to unplug the machine before you start.

The Co-Power 88 board comes as a kit with six parts. Photo 1 shows what is included in the package.

Only the Beginning

Begin by taking the cover off the Kaypro—just lift it straight up. Now try to identify the major components of the machine. The CRT monitor and control board are on the lower left side as you face the computer; the disk drives are in the aluminum shell on the right; and the power supply is on the back, behind the CRT.

The heart and soul of the machine is the main board on top. The Kaypro is a basic single-board computer with most of its components on one big board. This is important because the boards are thin and delicate.

Look around on the main board and locate the Z80 CPU chip—it may even be labeled. It is a large chip, near the front center of the board. Carefully lift this chip out. Notice which direction the notch in one end is pointing (it should be to your left as you are facing the computer). Be careful not to bend or break any of the pins.

Find the socket in your kit and carefully install it where you removed the Z80. It's a good idea to reach under the board with one hand while pushing the socket in place to lessen the chance of breaking the board.

Board Meets Board

Next, find the adapter board (see Photo 2). This is the device that interfaces your Kaypro to the coprocessor board (Photo 3). Carefully install your Z80 CPU in the socket on this board.

If you hold up the little board so that the words Pin 1 and U2 and the bank of four resistors are at the top, you can install the Z80 with its notch pointing up. While you have this board in hand, take the ribbon cable and plug it in. Match the red stripe on the cable with the little white dot at the upper left corner of the board.

Now, install the adapter board. First, you should check the placement of the four little round capacitors near the socket for the CPU. You may have to gently bend them down out of the way, being careful not to break them off. One pin is definitely in the way and can't be bent enough.

Once again, you should reach under your main board to support it. Note the direction all of the chip notches are pointing. Look at your main board and note that the notches are all pointing to your left. Gently press the board into place. Try not to bend the pins.

Plug the twisted pair of red and black wires (power wires) into the coprocessor board. Plug the red wire into the prong marked with a plug sign, and the black wire into the one marked with a minus sign.

Now, plug the ribbon cable into the coprocessor board, matching the red stripe to the white dot by the socket. If you have an extra 128Kb RAM card, now is the time to plug it in. Because of the way it's pinned, there is no way you can plug it in wrong.

Use a 7/64" allen wrench to loosen the two mounting screws on the right rear side of your disk drives. Screw them out about ¼-inch. Carefully push the wires behind the drives out of the way and maneuver the new board into place.

The fit should be nice and cozy. The notches on the bracket slip under the loosened screws. Adjust the board to allow as much room as possible behind the drives for ventilation (you may even want to consider adding a small cooling fan), and tighten the screws again.

The last step is to solder the power leads to pins 4 and 6 of J5 at the back right-hand side of the main board. Use a low-power soldering pen and thin-gauge, rosin-core solder.

You should first melt a drop of solder into the bare ends of the wires and a drop onto the surface of the pins where they stick up from the board. Be careful not to heat the board itself. Gently solder the red wire to pin 6 and the black wire to pin 4.

Once you have double-checked all your work and tucked all the wires back so they do not rub or short, you're ready to put the lid back on and take the computer for a test drive.

Test Driving 16-Bit Power

Once the board is installed, it's a fairly easy process to switch on the 16-bit processor. You may have either the CP/M-86 or MS DOS operating system. Most likely, you'll want MS DOS, because IBM uses PC DOS, its first cousin. MS DOS opens the door to some IBM software, which the new board will run.

There are two files you must copy onto your CP/M-80 system disk to enter MS DOS. They are MSDOS .COM and MSDOS.SYS. Insert your system disk into drive A and type MS DOS. In a few seconds a message appears on your screen asking you to place an MS DOS system disk in drive A. Do this and type L to load the new operating system. Now you're ready to go.

My test drive of this new system included trying five different software packages. I wanted to see what would and would not run with the modifications.

First, though, I had to format and copy a number of disks. This is a relatively easy job if the hardware will

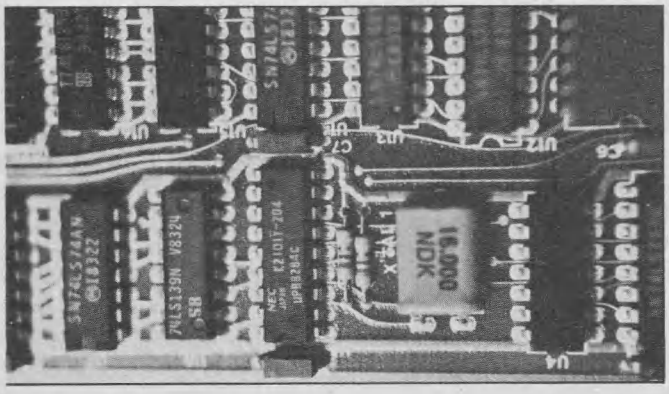


Photo 3. Coprocessor board.

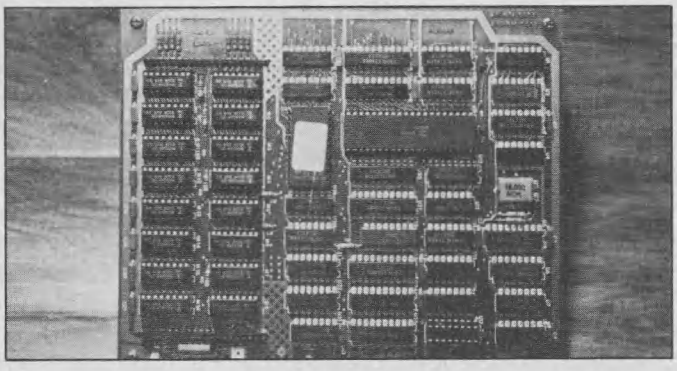


Photo 4. Strips of copper have been etched into the coprocessor board to serve as electrical conductors.

cooperate. Mine was a little balky. The drives that functioned perfectly under CP/M-80 didn't always start up when they should have and didn't read the data correctly about half the time.

Suspecting a problem with the operating system itself, I called SWP and they offered me a patch (to install with DDT) that helped. The formatting errors I was having with drive B were over and the system seemed to run fine. It formatted and copied disks like a charm.

But the patch did not completely cure my problems. As I got further along, I tried to load PeachText 5000. I finally concluded that it can't be loaded and run as my copy of the system now stands. There seems to be a bit of incompatibility that I have yet to figure out.

After some initial frustrations, I discovered that there are two ways to format disks with this version of MS DOS—with either the 160Kb IBM format or a more generic format that allows 200Kb per disk.

The operating system that formats the disk has a great deal of difficulty reading the 200Kb disk, and produces "sector not found" messages. It works far better with the IBM disk format. The error messages all but disappeared.

There are some variations in the operating systems that were necessary to interface the Co-Power 88 to the existing computer. The MS DOS is a customized version of the generic MS DOS from Microsoft. The patch mentioned above did cure most of the disk problems I was having.

Experiments and Discoveries

I experimented with the IBM version of Perfect Writer. It loaded and ran just fine, with a couple of exceptions. The IBM requires a 25-line screen for display while the Kaypro supports only a 24-line display. This means that the echo lines Perfect Writer places at the bottom of the screen write over each other at times.

The other difficulty is the way Perfect Writer scrolls the screen. This is accomplished on a line-by-line basis rather than a screen at a time. When I wanted to insert something in the middle of a line, I had to wait for it to move everything down. It's definitely slower than the eight-bit version I've become used to.

I started looking at the board. I double-checked my installation and found it to be exactly as described in the instructions. A little more snooping revealed that the CPU chip was getting so hot within ten minutes after turning on the machine that I couldn't touch it.

Chips must be cool to function properly. I have been told that the 8088 is a hot-running chip and is power-hungry. You might consider glueing a heat sink to the back of the chip and installing a fan in your Kaypro.

I also found bubbles in the copper traces (the strips of copper etched into the board, like lines on a road map, to serve as electrical conductors) where components had been soldered in. (See Photo 6.) Although I began to question the quality behind the board's construction, my feeling is that this is an exception rather than the rule.

Kaypro has a fairly solid reputation for making well-built and rugged computers. I don't think it would sign up for this board if there were any serious problems.

I also found a spelling checker that performs fairly well without modification. It is SPELLIT, version 1.3, by Berzurk Systems of Berkeley, CA. It runs almost flawlessly. There is a small problem with cursor movement but that doesn't prevent it from working.

At this point, I have to say that the court is still in session and searching for evidence. The 16-bit power of this unit has yet to be proven. I haven't made any final judgements on the Kaypro II Plus 88 yet.

I do, however, see some exciting possibilities for IBM compatibility here—it should get better as time passes.

A RAM Discussion

The Co-Power 88 board in your Kaypro will serve very well as a third disk drive in the form of a RAM disk. A RAM disk is a solid-state device that works like a disk drive with one significant exception—the memory is volatile. This means that, if there is a power outage, anything and everything in the RAM disk is lost forever.

The RAM disk works in the eight-bit mode when you're operating under CP/M-80. The chips are the same RAM memory normally used for the 16-bit coprocessor. These are specially set up to allow them to do double duty.

There are several advantages to having a RAM disk, the most important being speed. This advantage is especially important if you use database or accounting programs that access the disk frequently.

With normal disk drives, the entire operation is slowed down by the mechanical operations of searching for the data and retrieving it. The drive contains electric motors and read/write heads that must move rapidly across the surface of the disk to find things that may be scattered.

The RAM disk gains speed because there is no mechanical intervention. Everything is done at memory speed as fast as the CPU can handle it. The entire operation is electronic and there are no moving parts. If the disk drive needs one half-second to search for something, the RAM disk can do the same in perhaps one hundredth of a second.

Noise is another consideration. There isn't any. Because there are no mechanical parts, there is nothing to rattle or chatter. Nor is there anything loose (like a read/write head) to jostle around in transit. Once installed, the RAM disk sits in place and works quietly, as you wish everyone else would.

The system disk furnished with the hardware comes with two files necessary for RAM disk operation. They are MD.COM and MDRV.SYS. To use the RAM disk, copy these two files onto your CP/M-80 system disk. Load this disk when you start up the machine. Then type MD and press return.

These programs alter your CP/M-80 operating system to recognize the Co-Power board's RAM memory as a third disk drive, known as M. This format also allows up to 247Kb of usable storage space.

The operation only takes a couple of seconds and the normal A> prompt returns. You should never try to reformat the RAM disk with your regular disk formatting utilities.

You may verify the presence of the third disk drive by calling up a directory of the drive. If it's running correctly, you should obtain a blank directory, without any BDOS errors. Better still, if you have a public domain directory program that counts files and lists their sizes, use that to verify that you actually have 247Kb of space available.

Copious Copying

Now you are ready to copy programs or data into the M drive. You should use PIP for this operation; it is fast and does not interfere with the

formatting of the drive.

The copy program furnished with the Kaypro treats disks in terms of tracks and sectors. That is, it copies data by reading the disk one track at a time and transferring this over to the next disk. It can also format the disk as it goes. This would confuse the issue for the RAM disk. PIP operates in terms of files, copying one at a time. This is better because it will not confuse and scramble the RAM disk.

To test the power of the RAM disk, I took The Word+ (one of the spelling checkers bundled with the Kaypro) and installed it. The Word+ has a 137Kb dictionary of 45,000 words and a collection of a dozen or so programs that work together to proofread your text. It first reads your text and compiles an alphabetical word list containing the vocabulary of the text. It then compares this list, word-for-word, with the main dictionary and with any updated dictionaries you may have created. When this is done, it asks you to interact and respond to its findings.

The word list is stored on the same disk as the dictionary. The most time-consuming operation, besides the interactive correction operation, is matching the vocabulary with the dictionary.

Using normal floppy disks, this can often take five to seven minutes. The drives can work only so fast. Using the RAM disk on my hot-rodded Kaypro, I cut this proofreading time to a mere 47 seconds to check a 40-page (48Kb) text. The difference was incredible! Never again will I check spelling in any other way.

When I tested this RAM disk against both Perfect Writer and WordStar 3.3, I found little advantage. Both popular word processors expect their programs to be on the system disk, drive A.

Unless someone comes up with a patch for these, you will have to continue to use them in the old ways. It is possible to put your text files in the RAM disk, however, and that helps a lot when formatting and printing.

Since Perfect Writer has the annoying characteristic of writing an intermediate file to disk for printing purposes (causing it to waste over half of the disk's capacity), why not write that ".fin" file to RAM disk and throw it away when you are done, rather than losing real disk space? Just remember the volatility of random access memory.

I also see a great potential here for spreadsheets and database managers. These programs generally have to analyze a large amount of data and rearrange it.

This can be a slow process on normal disk drives because of mechanical intervention. If you can copy this data into the RAM disk, the process can be speeded up to a fraction of its normal time.

Be careful—any data you have in the RAM disk is gone forever when the lights go out.

Beware. . .

There is one thing you have to be very careful of—power outages or surges. Any programs or data you have in the RAM disk are lost and gone forever when the lights go out. It is absolutely essential to have back-up copies of your material before you trust it to RAM.

A suitable procedure might be to have a blank formatted disk inserted in drive B for copying purposes. Then, when the database program reaches a suitable stopping point, exit and PIP your newly sorted data onto the back-up disk before continuing. This safety step may take a few minutes, but it can save the agony of trying to recover lost data.

I did find one way to make the whole system crash while using the RAM disk. When using The Word+ to check spelling, I instructed the program to mark words that change length with a tilde (~). Then, I reentered Perfect Writer or WordStar and used the search function to locate and remove the tildes.

To make searching easier and faster, I used a public domain program from Bay Area Kaypro Users and Programmers (BAKUP) to program the numeric keypad as function keys. When I tried to use this, it was just too much and the whole system went out to lunch. The only way to regain control was to turn it off and restart from the beginning.

Simple Morals

The moral of this story is simple. If you are going to use other system enhancements along with your Co-Power 88 board, experiment first before you trust it with valuable or irretrievable data.

I mentioned that my Kaypro is speeded up. I have made a slight modification to make it run twice as fast as normal. I replaced the ROM chip controlling the monitor and wired in a switch that allows me to choose between two speeds.

The Kaypro II normally operates at 2.5 MHz. Now it can run at a full five MHz and the only thing slowing it down is the disk drives.

Naturally, I had to upgrade to a faster CPU, the Z80B chip. This upgrade is hard-wired in and does not introduce any wait states (extra time-delaying loops to allow the video section to catch up). The upgrade permits faster overall operation than most 5 MHz modifications. The nice thing about this one is that you can do it all for less than $50.

A First Evaluation

The Co-Power 88 coprocessor board is a handsome addition to the Kaypro. It offers many useful features at a fraction of their separate prices. It is compact and tidy. Generally, it is a good upgrade towards the "poor man's" IBM.

This is the only low-cost combination 8/16-bit computer I know of. You could pay about $3600 for a Zenith Z-100 and still have to buy software. You could pay almost $10,000 for a Compupro 8/16 or you could buy a Kaypro II Plus 88 for under $2,000, complete with a software package. The Kaypro 4 Plus 88 is supposed to cost only $200 more. The software is all eight-bit, plus the 16-bit operating systems.

You can get all of this extra power for what the Kaypro II cost a year ago. The other alternative is to buy an IBM for a lot more money, but you'd still have to buy software, and you still wouldn't be able to run any eight-bit software.

In the eight-bit mode, the primary advantage is speed. There is little to rival the speed of a RAM disk where frequent disk operations are necessary. Programs that used to be slow run like lightning. If you have the two-speed modification I mentioned, then there is no comparison.

In the 16-bit mode, there are a few trade-offs you have to consider. There are some things the board will not do.

While it claims to be a PC-compatible, there are definite limits to that

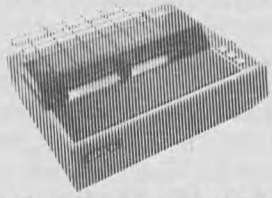
Circle 21 on Reader Service card.

SAVE AT ELEK-TEK ON PRINTERS

HUGE SAVINGS ON ALL EPSON PRINTERS

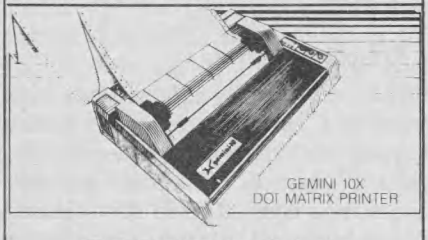
MX 80 FT MX 100
FX 80 FX 100

CALL FOR SUPER LOW PRICES



EPSON RX-80 275.00

8750 Ribbon Cartridges for Epson 80 Column Printers 4.00
8755 Ribbon Cartridges for Epson 132 Column Printers 7.00



GEMINI 10X DOT MATRIX PRINTER

GEMINI 10X $275.00

GEMINI 15 15 in. wide carriage $399.00

NEW HIGH SPEED DELTA 10 — call for price

Gem 01 Ribbons for Gemini Printers - 6 for 15.00 12 for 24.00

Cables for Epson or Gemini

PA10A 10 ft. 36/36 pin standard parallel 30.00
IB-P10 10 ft. 36/25 pin parallel for IBM 32.00
PA6T 6 ft. 36/16 pin parallel for TI-99/4A 25.00
RS10A 10 ft. 25 pin standard RS-232(full loaded) 21.00
RS1Y RS-232 Y cable for TI-99/4A 35.00

PRINTER INTERFACES DISCOUNTED TOO!

LETTER QUALITY PRINTERS $500—$1,550 TTX — COMREX — DIABLO

CALL TOLL FREE 800-621-1269 EXCEPT Illinois, Alaska, Hawaii

Corp. Accts. invited. Min Ord. $15.00 Mastercard or Visa by mail or phone. Mail Cashier's Check, Money Ord., Pers. Check (2 wks to clr.) Add $4.00 1st item. **(AK, HI, P.R., Canada add $10.00 first item)** $1.00 ea. add'l shpg. & handl. Shipments to IL address add 6% tax. Prices subj. to change. **WRITE for free catalog. Return policy for defective on arrival replacements only: 90 day mfr. wty. ALL ELEK-TEK MERCHANDISE IS BRAND NEW, FIRST QUALITY AND COMPLETE.**

ELEK-TEK, inc. 144
6557 N. Lincoln Ave., Chicago IL 60645
(800) 621-1269 (312) 677-7660

compatibility. As listed in the documentation, they are:

- The most immediate problem is with the monitor. A lot of current IBM software is designed to communicate directly with the screen without going through the operating system. The Kaypro Plus 88 lacks this capability, so there are many newer packages you cannot run.
- You cannot run software that is graphics- or color-oriented. Kaypro II and 4 computers do not have any graphics capabilities. There are some add-on graphics boards available, but I don't know yet whether they will interact with this board (I have heard they will, but cannot confirm the rumor yet). You will have to forget about Lotus 1-2-3 for now. (Kaypro does claim that dBaseII will run, though.) Likewise, the Kaypro computer does not have any color capability. I have not heard of anyone yet offering a color board and monitor for it.
- You cannot run any software that depends on the IBM ROM chip. IBM stores a portion of its operating system here to keep folks like us from being too chummy. You may be able to find suitable ROM emulator software soon if some wizard out there chooses to tackle this problem with gusto. For now, though, forget about using IBM's Basic or BasicA. SWP is working on a version of Microsoft Basic to eliminate this problem. They expect it to be ready by the time you read this. I am told it will be an option you can purchase or have in place of CP/M-86.
- You cannot run software that is dependent on other IBM hardware features, such as function keys (unless you can obtain a suitable substitute command sequence). There are no break or alt keys on the Kaypro keyboard. Are there any inventors out there who could successfully devise a substitute keyboard for the Kaypro that would incorporate these features? Another suggestion would be to add code to the new MS DOS and CP/M-86 BIOSs that would configure the blue keypad to perform as IBM function keys and the alt key. A legend should be included in the documentation to show how to use these features.
- Forget light pens, too. The documentation says they don't work. It remains to be seen if they will permit this on the Kaypro 10 Plus 88 when it is available. I guess that means no mice for a while, too.

There are some subtle differences in the 16-bit operating systems, also. Generally, these are generic CP/M-86 and MS DOS systems. There are some exceptions, though. Some of the CP/M-80 utility programs don't function. You have to use your CP/M-80 utilities to format and copy disks.

In MS DOS, the problems mentioned above impose severe restrictions on your software choices.

There is a question of cost and value. If you are looking for *full* PC compatibility, you will have to spend too much money to add devices to an otherwise fine machine. If you can live with the trade-offs, then you can still be miles ahead of any older Kaypro.

The RAM disk is the most powerful benefit. Although there are other boards available to supply RAM disk power for about $600, why not spend a little more and get a second computer inside your Kaypro? All in all, it is a good value.

I suspect that they will have the bugs swatted before this is printed and it will be a good investment. If it can be made to run bug-free without the problems my early-model board had, this should be a fine addition to your Kaypro.

In fairness, I must point out that the Co-Power 88 board has been around for a couple of years and is well-tested. The problems I mention probably arise because this is a relatively new installation for this board.

Manual Matters

The documentation is a little flaky for the review board I am using. SWP included about 20 typewritten pages of information to get me started. While this was enough for me, it may not be enough for a beginner.

The MS DOS manual is almost nonexistent. It consists of 12 typed pages outlining the basics of what will work on the Co-Power board. There is no manual from Microsoft; I bought an IBM DOS 1.1 disk at a flea market just to get one.

I found out that SWP is rewriting a version of the MS DOS manual and should have it ready for shipment by the time you read this. SWP was kind enough to send me an early draft preview and it looks good. It will be a most welcome addition.

SWP did include the Digital Research manual for CP/M-86 with a sheet qualifying it for its board. It is only slightly better than the usual Digital Research offerings. ■



1984 OFFICE AUTOMATION CONFERENCE®

LA's the place.

LOS ANGELES CONVENTION CENTER • CALIFORNIA
FEBRUARY 20-22, 1984

SPONSORED BY AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, INC.

OFFICE AUTOMATION & YOU

The 1984 Office Automation Conference, "Office Automation & You," will highlight the most recent advances in OA, as they affect your role as a professional, manager, or user. This is YOUR conference.

OAC '84, the leading annual conference in the office automation industry, offers you the opportunity to:

* Learn more about OA; with over 45 Program Sessions, 8 in-depth Professional Development Seminars, and 6 Industry Workshops.
* Hear authoritative speakers, including Keynote—David T. Kearns, President & CEO of Xerox Corporation.
* See more than 150 major companies exhibiting their products & services.
* View numerous new products and developments introduced at OAC.
* Evaluate and compare specific products and services.

For additional information, complete the coupon below and send to: OAC '84, AFIPS, 1899 Preston White Drive, Reston, VA 22091.

Or, REGISTER TODAY via our toll-free number: 800-OAC-1984, using American Express, MasterCard, or Visa.

For more information, mail this coupon today

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

Mail to:
OAC '84
AFIPS
1899 Preston White Dr.
Reston, VA 22091

5 6

Circle 181 on Reader Service card.

CP/M of a Different Color

The Commodore-64 provides 16 colors to choose from, but the Z80 add-on cartridge doesn't support changing colors once the CP/M system disk is loaded. In this article, the author provides a program to let you select border, screen and character colors in CP/M.

By Jeffrey H. Miles

It is possible to select from 16 colors for the Commodore-64's border, screen and characters. However, the CP/M software provided with the Commodore Z80 add-on microprocessor cartridge doesn't support changing colors after the CP/M system disk is loaded.

Listing 1. Program to add color to C-64s running CP/M.

```
                ;(c) copyright 1984 jeffrey hilton miles
                ;all rights reserved
                ; acolor.asm
                
0100                    org 100h
                ;
0000 =          boot    equ 0000h           ; jmp to 'boot' to reboot
0002 =          cono    equ 2               ; console output function
0005 =          bdos    equ 0005h           ; dos entry point
0040 =          stksiz  equ 64              ; stack size
                ;
                ;screen control codes
000d =          cr      equ 0dh             ; carriage return
000a =          lf      equ 0ah             ; line feed
0093 =          clear   equ 093h             ; clear screen
0012 =          rvson   equ 012h            ; reverse on
0092 =          rvsoff  equ 092h           ; reverse off
                ;
                ;time delay parameters
00f0 =          mscnt   equ 240
00f0 =          etime   equ 240
0018 =          dtime   equ 24
                ;
                ;bios65 parameters
0001 =          off     equ 1
f901 =          data    equ 0f901h          ; data register
0003 =          vicout  equ 3               ; output data to screen
f900 =          cmd     equ 0f900h          ; command register location
ce00 =          modesw  equ 0ce00h             ; mode switch location
                ;
0100 c3a101     start:      jmp cold            ; cold start
                ;
0103 1eff       pkkey:mvi e,0ffh
0105 0e06             mvi c,6               ; direct console input
0107 c30500           jmp bdos
                ;
                ;print a character
                ;
010a e5d5c5     pchar:  push h! push d! push b; saved
010d 0e02               mvi  c,cono
010f 5f                 mov  e,a
0110 cd0500             call bdos
0113 c1d1e1             pop b! pop d! pop h ; restored
0116 c9                 ret
0117 931111111signon: db clear,17,17,17,17,17
011d 1d1d1d1d1d         db 29,29,29,29,29,09ch
0123 0d0a12             db cr,lf,rvson
0126 20434f4c4f         db ' color for the '
0135 0d0a1d1d1d         db cr,lf,29,29,29,rvson
013b 20434f4d4d         db ' commodore 64 cp/m '
014e 1111111111         db 17,17,17,17,17,17,17
0155 1111111111         db 17,17,17,17,17,17
015b 0d0a12             db cr,lf,rvson
015e 2843292043         db '(c) copyright 1984 '
0171 924a454646         db rvsoff,'jeffrey hilton miles '
0187 0d0a202041         db cr,lf,'  all rights reserved  4'
                ;
                ;continuation of cold start
                ;set up stack
01a1 318d04     cold:  lxi sp,stktop
                ;
01a4 111701     mes:    lxi d,signon          ; signon message ready
01a7 cd9202             call print            ; send it
01aa cda202             call delay
```

More

Colorful Characters

This article provides you with a program that can be used with the CP/M operating system to select border, screen and character colors. Furthermore, I'll give examples of how to use other screen control parameters, such as cursor down, cursor left and clear.

The program is written in 8080 assembly code and uses both CP/M BDOS input/output calls and BIOS-65 function codes.

In lines 10–38 of the program listing, the program origin is placed at 100 hex and equivalences are made to the following:

- the jump instruction to the warm-start entry point in the BIOS (boot)
- the jump instruction to the BDOS main entry point (bdos)
- the BDOS function parameter for console output (cono)
- the stack size (stksiz)
- five screen control codes
- three time-delay parameters
- five parameters used with the BIOS65 function code.

Lines 39–75 show the BDOS direct console input routine (pkkey), the console output routine (pchar), and the sign-on message (signon) and initialization code. Note some of the screen control codes that are used in the sign-on message, including cur-

Address correspondence to Jeffrey H. Miles, 24201 E. Groveland, Beachwood, OH 44122.

sor down (17,11 hex), cursor right (29,1D hex) and purple (156,9C hex).

From the starting location (start), the program jumps to location Cold, where a local stack is created for this program. Then a call is made to print the Signon message. The string of characters, beginning at Signon and ending when a dollar sign is reached, is sent to the screen using the BIOS65 function code procedure. The Print routine is at lines 225–232.

Lines 77–105 comprise the part of the program that prints the menu and waits for a selection.

Ready for Input

After printing the menu, a greater-than (>) character is printed to show that the program is ready for input. The coding of the menu input loop takes a character from the keyboard and echoes it back to the screen. The input character is kept in the accumulator through the use of the Push and Pop PSW commands. The loop next tests for the various permissible options. If a match is found, a jump is made to the appropriate location to change the border color (borcol), the screen color (scncol), the character color (symcol), or to perform a warm start.

Lines 108–130 contain the code used to change the border and screen color. The border color code displays a message on the screen, waits for an input selection, and then checks to see if the input selection is an *m*. If an *m* is selected, the program returns to the menu. The selected color code, which is in a range from F0 to FF hex, is stored in Z80 address C020 hex, which corresponds to 6510 address D020 hex, to make the border color selection.

A similar procedure is used to select screen color. However, the color code is stored in Z80 address C021 hex, which corresponds to 6510 address D021 hex, to make the screen color selection.

Lines 132–161 contain the subroutine that waits for an input selection and produces an appropriate character to store in the location used to select the border or screen color. The routine prints a greater-than sign to show the program is ready for input. Then it takes a character from the keyboard, echoes it to the screen and stores it for later use.

Next, the location of the start of the color code string of characters is stored in the HL register pair, and the location of the key code string of char-

Listing continued.

```
 82:                    ;
 83:                    ;print menu
 84:                    ;
 85:  01ad 11b502       first: lxi     d,menu
 86:  01b0 cd9202                call    print
 87:                    ;
 88:                    ;
 89:  01b3 111604              lxi   d,keymes
 90:  01b6 cd8c02              call  sendm
 91:                    ;
 92:                    ;select menu item
 93:                    ;
 94:  01b9 cd0301       warm: call  pkkey
 95:  01bc f5                push  psw
 96:  01bd cd0a01              call  pchar
 97:  01c0 f1                pop   psw
 98:                    ;
 99:  01c1 fe31                 cpi     031h
100:  01c3 cad801               jz      borcol
101:  01c6 fe32                 cpi     032h
102:  01c8 caed01               jz      scncol
103:  01cb fe33                 cpi     033h
104:  01cd ca3902               jz      symbcol
105:  01d0 fe34                 cpi     034h
106:  01d2 ca0000               jz      boot
107:  01d5 c3b901               jmp     warm        ; not a valid response
108:                   ;
109:                   ;
110:                   ;change border color
111:                   ;
112:  01d8 113f03      borcol: lxi   d,bormes
113:  01db cd8c02             call  sendm
114:  01de cd0202             call  sel1
115:  01e1 fe4d               cpi   04dh
116:  01e3 caad01            jz    first
117:                   ;
118:  01e6 2120c0      bor2:  lxi   h,0c020h
119:  01e9 77                mov   m,a
120:  01ea c3d801            jmp   borcol
121:                   ;
122:                   ;change screen color
123:                   ;
124:  01ed 118003      scncol: lxi   d,scrnmes
125:  01f0 cd8c02             call  sendm
126:  01f3 cd0202             call  sel1
127:  01f6 fe4d               cpi   04dh
128:  01f8 caad01            jz    first
129:                   ;
130:  01fb 2121c0      scn2:   lxi   h,0c021h
131:  01fe 77                mov   m,a
132:  01ff c3ed01            jmp   scncol
133:                   ;
134:                   ;select border or screen color
135:                   ;
136:                   ;
137:  0202 111604      sel1:   lxi   d,keymes
138:  0205 cd8c02             call  sendm
139:  0208 cd0301      sela:   call pkkey
140:  020b f5                 push psw
141:  020c cd0a01             call pchar
142:  020f f1                 pop  psw
143:  0210 321a04             sta  kychk
144:  0213 213c04             lxi  h,clrsb
145:  0216 112c04             lxi  d,keylst
146:  0219 7e          selb:   mov  a,m
147:  021a fe24               cpi  '$'
148:  021c ca2e02             jz   selc
149:  021f 47                 mov  b,a
150:  0220 1a                 ldax d
151:  0221 4f                 mov  c,a
152:  0222 3a1a04            lda  kychk
153:  0225 b9                cmp  c
154:  0226 ca3702            jz   seld
155:  0229 23                inx  h
156:  022a 13                inx  d
157:  022b c31902            jmp  selb
158:  022e 3a1a04      selc:  lda  kychk
159:  0231 fe4d              cpi  04dh
160:  0233 c8                rz
161:  0234 c30802            jmp  sela
162:  0237 78          seld:  mov  a,b
163:  0238 c8                rz
164:                   ;
165:                   ;
166:                   ;
167:                   ;select character color
168:                   ;
169:                   ;
170:  0239 11c103      symbcol: lxi   d,symmes
171:  023c cd8c02             call  sendm
172:                   ;
173:                   ;
174:  023f 111604             lxi   d,keymes
175:  0242 cd8c02             call  sendm
176:                   ;
177:  0245 cd0301      symb1:    call  pkkey
178:  0248 f5                   push  psw
179:  0249 cd0a01               call  pchar
180:  024c f1                   pop   psw
181:  024d 321a04               sta  kychk
182:  0250 211b04               lxi h,clrlst
183:  0253 112c04                lxi d,keylst
184:  0256 7e          symba:     mov a,m        ;color in acc.
185:  0257 fe24                   cpi '$'        ; $?
186:  0259 ca6b02                 jz  symbb      ; yes done
187:  025c 47                     mov b,a        ; store color in b
```

More →

acters is stored in the DE register pair. Then the color code selection loop is entered. The selection loop ends when a dollar sign is selected. The character in the string starting at location Clrsb is selected by the address in the HL register pair and stored in the B register.

An admissible key code stored in the character string Keylst is selected by the address in the DE register pair and stored in register C. The keyboard-selected key is returned from storage location Kychk and compared with the key code stored in register C.

Make Me a Match

If a match is not found, HL and DE are incremented. If a match is found, the routine returns to the appropriate point from which is was called. If a dollar sign is found, the routine checks to see if *m* was pressed and returns to the calling program if it was. Otherwise, it checks the keyboard and restarts the loop.

Lines 165–212 show the coding used to change the character color. The routine is similar to the one in lines 132–161. This routine selects an appropriate screen color code from the list stored at location Clrst, depending on the key selected. After being selected, the screen color code is stored in the data register used to pass data between the BIOS80 and BIOS65 (data).

The BIOS80/BIOS65 function code for writing a character to the screen (vicout) is stored in the command register (cmd). Then the Z80 is switched off by storing a one (off) in location Modesw. After sending the color code to the screen, the routine returns to await a new color code selection or *m* to return the program to the main menu routine.

Lines 218–243 show the string-printing subroutines and the time-delay subroutine. The Sendm subroutine is a BDOS function that writes a character string to the screen until a dollar sign is found. However, it sends only CP/M characters to the screen. Consequently, the Print routine using the BIOS80/BIOS65 function procedure is needed to send screen color-code selection symbols to the screen.

The rest of the program contains the message strings, the color-code strings for the characters, the screen and the border, and the string of legal keys.

This article should make your use of the Commodore-64 CP/M more colorful.■

Listing continued.

```
188:  025d 1a                    ldax d
189:  025e 4f                    mov  c,a       ; store key in c
190:  025f 3a1a04                lda  kychk   ; get key into acc.
191:  0262 b9                    cmp  c
192:  0263 ca7602                jz   symb2
193:  0266 23                    inx  h
194:  0267 13                    inx  d
195:  0268 c35602                jmp  symba
196:  026b 3a1a04    symbb:      lda  kychk
197:  026e fe4d                  cpi  04dh
198:  0270 caad01                jz   first
199:  0273 c34502                jmp  symb1
200:                 ;
201:                 ;
202:                 ;
203:  0276 78        symb2: mov    a,b
204:  0277 3201f9           sta    data
205:  027a 3e03             mvi    a,vicout
206:  027c cd8202            call   io6510
207:  027f c33902             jmp    symbcol
208:                 ;
209:                 ;
210:  0282 3200f9    io6510:sta    cmd
211:  0285 3e01             mvi    a,off
212:  0287 3200ce           sta    modesw
213:  028a 00               nop
214:  028b c9               ret
215:                 ;
216:                 ;
217:                 ;
218:                 ;
219:                 ;
220:                 ; send ascii message until '$' is found
221:                 ;
222:  028c 0e09      sendm: mvi    c,9           ; select print string function
223:  028e cd0500           call   bdos
224:  0291 c9               ret
225:                 ;
226:                 ;
227:  0292 1a        print:  ldax  d   ; get byte
228:  0293 fe24              cpi   '$' ; $?
229:  0295 c8                rz        ; yes, done
230:  0296 3201f9            sta   data
231:  0299 3e03            mvi   a,vicout
232:  029b cd8202          call  io6510
233:  029e 13              inx   d
234:  029f c39202          jmp   print
235:                ;
236:  02a2 3e1B      delay: mvi   a,dtime
237:  02a4 0ef0      dly3:  mvi   c,etime
238:  02a6 06f0      dly2:  mvi   b,mscnt
239:  02a8 05        dly1:  dcr   b
240:  02a9 c2a802           jnz   dly1
241:  02ac 0d               dcr   c
242:  02ad c2a602           jnz   dly2
243:  02b0 3d               dcr   a
244:  02b1 c2a402           jnz   dly3
245:  02b4 c9               ret
246:
247:                ;
248:                ;
249:  02b5 9312444f20menu:  db    clear,rvson,'do you wish to:',cr,lf,lf
250:  02c9 312e434841       db    '1.change border color',cr,lf
251:  02e0 322e434841       db    '2.change screen color',cr,lf
252:  02f7 332e434841       db    '3.change symbol color',cr,lf
253:  030e 342e524554       db    '4.return to cp/m',cr,lf,lf
254:  0321 12504c4541       db    rvson,'please enter selection (1-4)$'
255:                ;
256:  033f 0d0a454e54bormes:db    cr,lf,'enter border color selection (0-f)',cr,l
257:  0365 454e544552       db    'enter m to return to menu $'
258:                ;
259:  0380 0d0a454e54scrnmes:db   cr,lf,'enter screen color selection (0-f)',cr,l
260:  03a6 454e544552       db    'enter m to return to menu $'
261:                ;
262:  03c1 0d0a454e54symmes:db    cr,lf,'enter symbol color selection (0-f)',cr,l
263:  03e7 454e544552       db    'enter m to return to menu $',cr,lf
264:                ;
265:  0404 494e56414cermes:db     'invalid response',cr,lf
266:                ;
267:  0416 0d0a3e24  keymes:  db  cr,lf,'>$'
268:                ;
269:                ;
270:  041a           kychk:  ds   1
271:  041b 90051c9f clrlst: db 090h,005h,01ch,09fh
272:  041f 9c1e1f9e          db 09ch,01eh,01fh,09eh
273:  0423 81959697          db 081h,095h,096h,097h
274:  0427 98999a9b          db 098h,099h,09ah,09bh
275:  042b 24                db '$'
276:  042c 30313233 keylst  db 030h,031h,032h,033h
277:  0430 34353637          db 034h,035h,036h,037h
278:  0434 38394142          db 038h,039h,041h,042h
279:  0438 43444546          db 043h,044h,045h,046h
280:                ;
281:  043c f0f1f2f3 clrsb:  db 0f0h,0f1h,0f2h,0f3h
282:  0440 f4f5f6f7          db 0f4h,0f5h,0f6h,0f7h
283:  0444 f8f9fafb          db 0f8h,0f9h,0fah,0fbh
284:  0448 fcfdfeff          db 0fch,0fdh,0feh,0ffh
285:  044c 24                db '$'
286:                ;
287:                ;
288:                ;
289:  044d                    ds     stksiz      ; reserve stack size
290:                stktop:
291:                ;
292:  048d                  end
```



SOFTWARE DESCRIPTIONS

TPM (TPM I) - $80 A Z80 only operating system which is capable of running CP/M programs. Includes many features not found in CP/M such as independent disk directory partitioning for up to 255 user partitions, space, time and version commands, date and time, create FCB, chain program, direct disk I/O, abbreviated commands and more! Available for North Star (either single or double density), TRS—80 Model I (offset 4200H) or II, Versafloppy I, or Tarbell I.

TPM-II - $125 An expanded version of TPM which is fully CP/M 2.2 compatible but still retains the extra features our customers have come to depend on. This version is super FAST. Extended density capability allows over 600K per side on an 8" disk. Available preconfigured for Versafloppy II (8" or 5"), Epson QX-10, Osborne II or TRS-80 Model II.

CONFIGURATOR I

This package provides all the necessary programs for customizing TPM for a floppy controller which we do not support. We suggest ordering this on single density (8SD).
Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE (SFREE), MACRO II ($100), LINKER ($80), DEBUG I ($80) QED ($150), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$815 Value **NOW $250**

CONFIGURATOR II

Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE (SFREE), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QSAL ($200), QED ($150), ZTEL ($80), TOP II ($100), BUSINESS BASIC ($200) and MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1485 Value **NOW $400**

MODEL I PROGRAMMER

This package is only for the TRS-80 Model I. Note: These are the ONLY CDL programs available for the Model I. It includes: TPM I ($80), BUSINESS BASIC ($200), MACRO I ($80), DEBUG I ($80), ZDDT ($40) ZTEL ($80), TOP I ($80) and MODEM ($40)
$680 Value **NOW $175**

MODEL II PROGRAMMER

This package is only for the TRS-80 Model II. It includes: TPM-II ($125), BUSINESS BASIC ($200) MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QED ($150), ZTEL ($80), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM ($40), MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1445 Value **NOW $375**

BASIC I - $50. a 12K - basic interpreter with 7 digit precision.

BASIC II - $100. A 12 digit precision version of Basic I.

BUSINESS BASIC - $200. A full disk extended basic with random or sequential disk file handling and 12 digit precision (even for TRIG functions). Also includes PRIVACY command to protect source code, fixed and variable record lengths, simultaneous access to multiple disk files, global editing, and more!

ACCOUNTING PACKAGE - $300. Written in Business Basic. Includes General Ledger, Accounts Receivable/Payable, and Payroll. Set up for Hazeltine 1500 terminal. Minor modifications needed for other terminals. Provided in unprotected source form.

MACRO I - $80. A Z80/8080 assembler which uses CDL/TDL mnemonics. Handles MACROs and generates relocateable code. Includes 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical ops, local and global symbols, linkable module generation, and more!

MACRO II - $100. An improved version of Macro I with expanded linking capabilities and more listing options. Also internal code has been greatly improved for faster, more reliable operation.

MACRO III - $150. An enchanced version of Macro II. Internal buffers have been increased to achieve a significant improvement in speed of assembly. Additional features include line numbers, cross reference, compressed PRN files, form feeds, page parity, additional pseudo-ops, internal setting of time and date, and expanded assembly-time data entry.

DEVELOPER I

Includes: MACRO I ($80), DEBUG I ($80), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$440 Value **NOW $150**

DEVELOPER II

Includes: MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), BUSINESS BASIC ($200), QED ($150), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM SOURCE ($40), ZTEL ($80), and DISASSEMBLER ($80).
$1280 Value **NOW $350**

DEVELOPER III

Includes: QSAL ($200), QED ($150), BUSINESS BASIC ($200), ZTEL ($80) and TOP II ($100)
$730 Value **NOW $300**

COMBO

Includes: DEVELOPER II ($1280), ACCOUNTING PACKAGE ($300), QSAL ($200) and 6502X ($150)
$1930 Value **NOW $500**

LINKER - $80. A linking loader for handling the linkable modules created by the above assemblers.

DEBUG I - $80. A tool for debugging Z80 or 8080 code. Disassembles to CDL/TDL mnemonics compatible with above assemblers. Traces code even through ROM. Commands include Calculate, Display, Examine, Fill, Goto, List, Mode, Open File, Put, Set Wait, Trace, and Search.

DEBUG II - $100. A superset of Debug I. Adds Instruction Interpreter, Radix change, Set Trap/Conditional display, Trace options, and Zap FCB.

6502X - $150. A 6502 cross assembler. Runs on the Z80 but assembles 6502 instructions into 6502 object code! Similar features as our Macro assemblers.

QSAL - $200. A SUPER FAST Z80 assembler. Up to 10 times faster than conventional assemblers. Directly generates code into memory in one pass but also to offset for execution in its own memory space. Pascal like structures: repeat...until, if...then...else, while...do, begin...end, case...of. Multiple statements per line, special register handling expressions, long symbol names, auto and modular assembly, and more! This one uses ZILOG Mnemonics.

QED - $150. A screen editor which is both FAST and easy to learn. Commands include: block delete, copy, and move to a named file or within text, repeat previous command, change, locate, find at start of line, and numerous cursor and window movement functions. Works with any CRT having clear screen, addressable cursor, clear to end of line, clear to end of screen, and 80X24.

ZTEL - $80. An extensive text editing language and editor modelled after DEC's TECO.

ZEDIT - $50. A mini text editor. Character/line oriented. Works well with hardcopy terminals and is easy to use. Includes macro command capability.

TOP I - $80. A Text Output Processor for formatting manuals, documents, etc. Interprets commands which are entered into the text by an editor. Commands include justify, page number, heading, subheading, centering, and more.

TOP II - $100. A superset of TOP I. Adds: embedded control characters in the file, page at a time printing, selected portion printing, include/merge files, form feed/CRLF option for paging, instant start up, and final page ejection.

ZDDT - $40. This is the disk version of our famous Zapple monitor. It will also load hex and relocatable files.

ZAPPLE SOURCE - $80. This is the source to the SMB ROM version of our famous Zapple monitor. It can be used to create your own custom version or as an example of the features of our assemblers. Must be assembled using one of our assemblers.

MODEM - A communication program for file transfer between systems or using a system as a terminal. Based on the user group version but modified to work with our SMB board or TRS-80 Models I or II. You must specify which version you want.

MODEM SOURCE - $40. For making your own custom version. Requires one of our Macro Assemblers.

DISASSEMBLER - $80. Does bulk disassembly of object files creating source files which can be assembled by one of our assemblers.

HARDWARE

S-100 — SMB II Bare Board $50. "System Monitor Board" for S-100 systems. 2 serial ports, 2 parallel ports, cassette interface, 4K memory (ROM, 2708 EPROM, 2114 RAM), and power on jump. When used with Zapple ROM below, it makes putting a S-100 system together a snap.
Zapple ROM $35. Properly initializes SMB I/II hardware, provides a powerful debug monitor.

IBM PC — Big Blue Z80 board $595. Add Z80 capability to your IBM Personal Computer. Runs CP/M programs but does not require CP/M or TPM. Complete with Z80 CPU, 64K add on memory, serial port, parallel port, time and date clock with battery backup, hard disk interface, and software to attach to PC DOS and transfer programs. Mfr'd by QCS.
50% Discount on all CDL software ordered at the same time as a Big Blue (and for the Big Blue).

APPLE II — Chairman Z80 $345. Add Z80 capability to your Apple II/II Plus computer. Runs CP/M programs with our more powerful TPM. Includes 64K memory add on (unlike the competition this is also useable by the 6502/DOS as well as the Z80), TPM, QSAL assembler, QED Screen Editor, and Business Basic. Mfr'd by AMT Research.
Apple Special $175. Buy the Apple Z80 Developer at the same time as the "Chairman" and pay only $175 instead of $325.

APPLE Z80 DEVELOPER

Includes: 6502X ($150), MACRO II ($100), MACRO III ($150), QSAL ($200), QED ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), ZDDT ($40) and BUSINESS BASIC ($200)
VALUE: $1250 **NOW $325**
$175 when purchased with AMT "Chairman" Board.

DISK FORMATS

When ordering software specify which disk format you would like.

CODE	DESCRIPTION
8SD	8" IBM 3740 Single Density (128 bytes/26 sectors/77 tracks)
8DD	8" Double Density (256 bytes/26 sectors/77 tracks)
8XD	8" CDL Extended Density (1024 bytes/8 sectors/77 traceks - 616K)
5SD	5.25" Single Density (TRS80 Model I, Versafloppy I, Tarbell I)
5EP	5.25" Epson Double Density
5PC	5.25" IBM PC Double Density
5XE	5.25" Xerox 820 Single Density
50S	5.25" Osborne Single Density
5ZA	5.25" Z80 Apple (Softcard compatible)

TPM INFO When ordering TPM I or II, in addition to Disk Format, please specify one of the following codes:

	CODE	DESCRIPTION
TPM I:	NSSD/H	North Star Single Density for Horizon I/O
	NSSD/Z	North Star Single Density for Zapple I/O
	NSDD/H	North Star Double Density for Horizon I/O
	NSDD/Z	North Star Double Density for Zapple I/O
	TRS80-I	TRS-80 Model I (4200H Offset)
	TRS80II	TRS-80 Model II
	VI8	Versafloppy I 8"
	VI5	Versafloppy I 5.25"
TPM-II:	VII8	Versafloppy II 8" (XD)
	VII5	Versafloppy II 5.25"
	TRS80II	TRS-80 Model II (XD)

ORDERING INFORMATION:

VISA/MasterCard/C.O.D.
Call or Write With Ordering Information....

OEMS:

Many CDL products are available for licensing to OEM's. Write to Carl Galletti with your requirements.

Dealer Inquiries Invited.

For Phone Orders ONLY Call Toll Free...

1-(800) 458-3491 (Except Pa.)

Ask For Extension #15

For information and Tech Queries call
(609) 599-2146

Prices and Specifications subject to change without notice.
TPM, Z80, CP/M, TRS80 are trademarks of CDL, Zilog, DRI and Tandy respectively.

Computer Design Labs

342 Columbus Avenue/Trenton, NJ 08629

Circle 18 on Reader Service card.

Amazing Game, How Sweet the Sound

Well, Crowther and Wood's Adventure game doesn't actually have sound effects, but it does offer a magical challenge to anyone willing to work his way through the twisty little mazes.

By Dafydd Dyar

Will Crowther and Don Wood's computer game Adventure is now a classic, the first of a new genre of interactive "storybook" programs.

Originally run on Stanford University's DEC PDP-11 minicomputer in 1975, Crowther and Wood's Colossal Caves, as it was then called, took the computer world by storm—thousands of man-hours were lost everywhere it appeared until everyone had solved the complex 300Kb puzzle. It is highly addictive to the type of mentality most attracted to computers: the puzzle-solver.

Adventure was eventually "transported" to microcomputers, where it spawned myriad variations and imitations. Dedicated Adventure players went on to create their own adventures, many of which became classics in their own right—David Lebling and Marc Blank's Zork, for example.

The most popular version for micros, Microsoft Adventure, was chosen as the first game for the IBM Personal Computer. Two commercial programs for "generating" adventures—Workman & Associates' Build-An-Adventure Kit for CP/M-80 systems and Hexcraft's Genesis for Apple DOS 3.3—are selling well, and there will probably be many more.

Dwarfs, Dragons and Trolls

On the wall near my computer is a map of CompuServe's New Adventure, done in orthographic projection, including a fierce green snake, nasty dwarf, ferocious bear, burly troll and huge dragon (but no pirate) and showing the initial location of every object in the Colossal Cave.

The Mazes, however, are *not* mapped out. They are shown only as a labyrinth of intersecting walls—you're strictly on your own in there.

I also made a map of Microsoft Adventure. It's similar to a flowchart, with circles for the various rooms and lines running out in all directions to indicate the network of connecting passages. This map does show the way through the Mazes, but only the shortest paths in and out—the Mazes are just too complex to be mapped this way. Make a typo (S instead of W, for instance) and you'll be on your own *here*, too.

If You Goof Up in the Mazes . . .

But the maps are really only for convenience. If I goof up in the Mazes, I have a tool that tells me where I am more accurately than any map. It's the same tool the original

Address correspondence to Dafydd Dyar, 12415 S. 28th St., Omaha, NE 68123.



programmers used to create the Colossal Cave and all of its many complex connections.

It's called a travel table.

A travel table is the simplest form of relational database, a two-dimensional array that shows the relationship of one room of the system to the others to which it connects. In this case, it's just a list of all of the rooms, numbered in the order in which they are encountered. The room numbers indicate the various connections by the direction of travel.

There are only ten ways you can move: north, northeast, east, southeast, south, southwest, west, northwest, up and down. If a connection exists in a particular direction, it is indicated by the number of the room to which it connects. A zero indicates that there is no travel in that direction—"you can't go that way!" Connections are left blank until they are known.

Colossal Cave Travel

Table 1 shows what you might get traveling in Colossal Cave from the Grate Room on. This simple 10×10 grid shows the connections between ten rooms in the ten possible directions. It's like the more familiar timetable, except that it shows relationships in space instead of time. We could call it a "spacetable," but that's really more confusing than helpful.

The travel table can show many things that cannot be shown easily on a conventional map, such as the fact that you can get from the Hall of Mists to the Hall of the Mountain King by going either north or down. It lets you see the relationship of the rooms logically rather than physically.

For example, the asterisk in the entry for the East Fissure indicates that the travel is conditional—the Crystal Bridge must be conjured before you can cross the Fissure. Similarly, the travel from the Hall Of Mists back to the Domed Pit is conditional upon your *not* carrying the giant gold nugget; take it, and you'll have to find another way out.

Do You Believe in Magic?

This brings us to another aspect of Adventure: magic.

Most conditional travel in Adventure is magical. You can travel long distances and past obstacles by using magic, or you can go a particular way from a particular room only when carrying (or not carrying) a particular magic item. Conditionals are difficult to mark on a conventional map, which tends to get cluttered just by the room names and connections, but the travel table handles them with ease.

You might want to add another column, marked M for magic, to note travels affected solely by magical means rather than physically in one of the ten directions. Adding such a purely logical connection is difficult with flowchart maps, but is easily handled by a simple extension of the table.

Of course, you won't be able to build such a complete table quite that easily. If, for instance, you were going along the westward line of travel and decided not to explore other tracks, you would have to leave entries for rooms 15 and 16 (known connections off of your line of travel) blank until you finally came to them. Since rooms and connections are numbered arbitrarily in the order they are encountered, you might get something like Table 2.

Here we get an entirely different array, because the order in which rooms are discovered and numbered and the order in which they are explored is not the same. The table's blank entries can't be filled until the rooms are finally explored. Sometimes these rooms don't really exist—the connection to Room 18 on this table is actually another route to Room 15, but you can't *know* that until you've been there.

Notice the bend between West Fis-

		N	NE	E	SE	S	SW	W	NW	U	D
8	GRATE ROOM	0	0	0	0	0	0	9	0	7	0
9	COBBLE CRAWL	0	0	8	0	0	0	10	0	0	0
10	DEBRIS ROOM	0	0	9	0	0	0	11	0	0	0
11	AWKWARD CYN.	0	0	10	0	0	0	12	0	0	0
12	BIRD ROOM	0	0	11	0	0	0	13	0	0	0
13	DOMED PIT	0	0	12	0	0	0	14	0	0	14
14	HALL OF MISTS	15	O	13*	0	16	0	17	0	13*	15
15	HALL/Mt. KING	18	0	14	0	19	20	21	0	14	0
16	NUGGET ROOM	14	0	0	0	0	0	0	0	0	0
17	EAST FISSURE	0	0	14	0	0	0	22*	0	0	0

Table 1. Impromtu travels in Colossal Cave.

		N	NE	E	SE	S	SW	W	NW	U	D	M
8	GRATE ROOM	0	0	0	0	0	0	9	0	7	0	0
9	COBBLE CRAWL	0	0	8	0	0	0	10	0	0	0	0
10	DEBRIS ROOM	0	0	9	0	0	0	11	0	0	0	2
11	AWKWARD CYN.	0	0	10	0	0	0	12	0	0	0	0
12	BIRD ROOM	0	0	11	0	0	0	13	0	0	0	0
13	DOMED PIT	0	0	12	0	0	0	14	0	0	14	0
14	HALL OF MISTS	15	0	13	0	16	0	17	0	13	18	0
15												
16												
17	EAST FISSURE	0	0	14	0	0	0	19*	0	0	0	0
18												
19	WEST FISSURE	0	0	17*	0	0	0	20	0	0	0	0
20	W.HALL/MISTS	19	0	0	0	21	0	22	0	0	0	0

Table 2. Westward travels in Colossal Cave.

		N	NE	E	SE	S	SW	W	NW	U	D
1	MTyL	2									
2	MLTy	3									
3	TgLM	4									
4	MTgL	5									
5	MLTg	6									
6	TgLM	1									

Table 3. North in the Maze of Twisty Little Passages, All Different.

		N	NE	E	SE	S	SW	W	NW	U	D
1	MTyL	2				4					
2	MLTy	3				5					
3	TgLM	4									
4	MTgL	5				2					
5	MLTg	6				7					
6	TgLM	1									
7	TyML					8					
8	TyLM					9					
9	TgML					10					
10	LMtg					V					
V=VENDING MACHINE		10	0	0	0	0	0	0	0	0	0

Table 4. South in the Maze of Twisty Little Passages, All Different.

		N	NE	E	SE	S	SW	W	NW	U	D
1	MTyL	2				4					H
2	MLTy	3				5					
3	TgLM	4									
4	MTgL	5				2					
5	MLTg	6				7					1
6	TgLM	1									
7	TyML					8					
8	TyLM					9					
9	TgML					10					
10	LMTg					V					5
V=VENDING MACHINE		10	0	0	0	0	0	0	0	0	0
H=W.END/LONG HALL		24	0	22	0	M	0	0	0	24	M

Table 5. Down and out in the Maze of Twisty Little Passages, All Different.

sure and West Hall of Mists—you go north rather than east to return. On a conventional map this might be more obvious, and, in fact, a flowchart-type map is easier to use when the connections are so straight-forward. But for complicated relationships, such as Bedquilt or the Mazes, the travel table is much easier to read and use.

A Maze Distinction

There are two different and distinct mazes in Colossal Cave. The Maze of Twisty Little Passages, All Different, is just south of the West End of the Long Hall. It is the simpler of the two because, as its name implies, the passages are indeed named differently, so each has its own unique identifier built in.

The first room is identified as the Maze of Twisty Little Passages, but moving in any direction brings a change of scene.

Going south, for example, the next room is the Maze of Twisting Little Passages, and the one after that is a Maze of Little Twisty Passages. A pattern develops: the names are all combinations of maze, little, twisty and twisting. There are 12 such permutations and they can be abbreviated with M for maze, L for little, Ty for twisty and Tg for twisting. Thus, Maze of Twisty Little Passages is shortened to MTyL.

As it happens, only 11 of the 12 permutations are actually used; there is no Little Twisting Maze or LTgM. That's because (with two exceptions) every room connects to every other room, and there are only ten possible directions. MTyL connects to the West End of the Long Hall (the outside), while another connects to the Vending Machine Room (inside).

Unlike the rest of Colossal Cave, the Maze doesn't identify obvious exits. You must work by trial and error, charting the actual paths you travel and leaving the rest blank until you get there. This isn't as bad as it sounds, since every direction leads somewhere.

A Long Haul North

The Maze is south of the West End of the Long Hall. If you are like most people, your first reaction is to go north to get back out, but that just takes you deeper into the Maze. If you continue north, you might get something like Table 3.

Five moves to the north takes you back to where you began. Hmm. You came in by going south, so why not simply continue the same way? Table 4 shows the results of that.

Moving south takes you right to the Vending Machine Room, but you still have to get back to West End of Long Hall to get out. One method is to keep going in a set direction until you come back to a room you know by name; then try another direction. Eventually, you'll find all the connections and be able to choose the best way in and out.

But first you need to find your way back to MTyL and from there to West Long Hall. This turns out to be surprisingly easy. Crowther and Wood, like so many other gamesters, couldn't resist making plays on words—like the "bear in room" sign outside the Barren Room. Here it's a play on "down and out"—going down takes you out, as illustrated in Table 5.

In Tables 4 and 5, I've charted the Maze as if it were a separate entity independent of Colossal Cave. Because of the complexity of the two Mazes, it is much easier to view them as separate systems connected to the Cave at one or two points but otherwise unrelated.

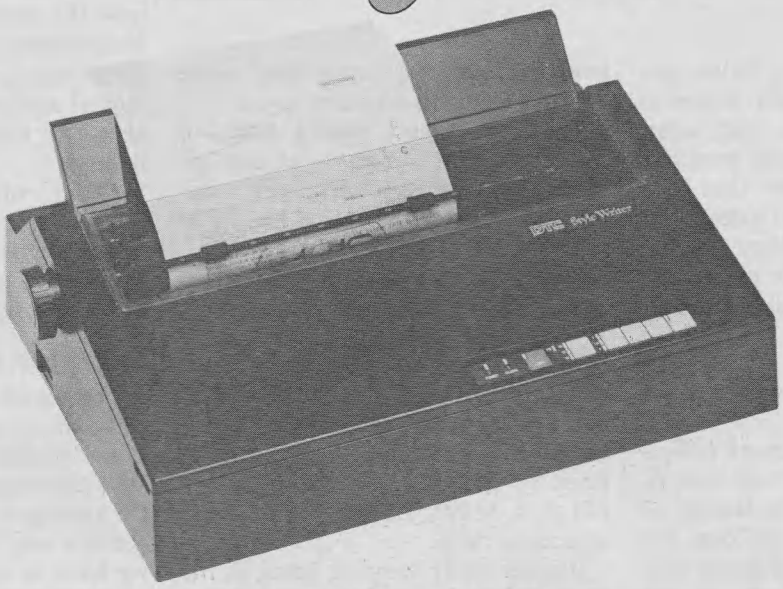
I use travel tables only for the Mazes, with conventional maps of the Colossal Cave system, but you may favor a different approach. It's the results that count, not the method. Like any other tool, the travel table works best when used in a manner that suits the user.

The travel table really shines when the relationships are convoluted and seemingly illogical; that's when conventional maps begin resembling spaghetti. Such is the case in the Maze of Twisty Little Passages, All Alike, located south (or down) from the West Hall of Mists.

Looking for Clues?

Here there are absolutely no clues, the descriptions are all identical and no exits are visible. The only way to map it is to carry in a handful of objects and drop them, like Hansel and Gretel with their breadcrumbs. Treasures may also be used, but the pirate may steal them—this Maze is his hidden lair.

The Latest Style



The DTC Style Writer™ should be your daisy wheel printer for professional letter-quality printing, when presentation of you and your information is important.

- 35K Buffer Memory
  frees computer from driving printer
- Automatic Proportional Spacing
  for professional appearance
- Graphic Quality
  for chart & graph applications
- Bi-directional Printing
  for increased print speed
- Cartridge Print Wheel
  for font variety, easily changed
- Toll Free 800 Telephone Number
  for readily answered questions
- Options
  Buffer Memory Expandable to 67K
  Sheet Feeder
  Forms Tractor

DTC means quality, service & support.
Drive a DTC Style Writer at your computer store, start printing with style for only $899.

DTC

Circle 310 on Reader Service card.

Data Terminals & Communications
590 Division Street, Campbell, CA 95008
800-962-8185 • In CA 800-538-9294

Distribution Inquiries Welcome

	N	E	S	W	U	D
MTyL 1		2	3	5		
MTyL 2		3		1		
MTyL 3	4	DE	4			
MTyL 4		2		0		
MTyL 5	1	0	5	5	0	0

Table 6. In the Maze of Twisty Little Passages, All Alike.



Fortunately, there are (with one exception) only *six* ways to travel in this Maze: north, south, east, west, up and down. The authors couldn't resist another joke, in that the pirate's chest is located in a dead end northeast of one of the Maze rooms. They also made the Maze extremely twisty, with passages leading back on themselves in emulation of infinite loops.

This maze can be frustrating, as shown in Table 6.

Dropping an object to mark MTyL 1, you might determine to go east as far as you can, dropping things as you go. This won't work for long, because you hit a dead end going east from MTyL 3. Dead ends always lead back to the room they were entered from, so no harm done.

Try south, and you're back in MTyL 1. Hmm. You went east already, why not west? Aha, new territory: MTyL 4. West again? No, "you can't go that way!" Give it a zero.

South? Takes you back to MTyL 2! Grrr. South again, and you're back to MTyL 1. Alright, then, west! MTyL 5, good. West again, and you're in: MTyL 5? East, maybe? No, can't go that way; zero. South? Loops back on itself again! Arrgh! North? Back to MTyL 1. South? MTyL 3, MTyL 4, MTyL 6! Now you're out of objects to drop. . . .

It's definitely tougher going in the Maze Of Twisty Passages, All Alike, but think how tough it would be if you had to *draw* all those tricky, twisty connections. This is where the travel table really comes into its own, and it's just as good out in the Forest or any place where you have a complex relationship of interconnected data.

I've used Crowther and Wood's Adventure Mazes as an example of how the travel table can be used to disassemble a complicated set of interrelationships that otherwise defy logical analysis. It's even more valuable as a tool for *constructing* such a data set.

As I mentioned earlier, the travel table is a simple relational database in the form of a two-dimensional array. But simplicity of form is not the same as simplicity of function.

Life is Just a Maze

The travel table can be a powerful programming tool, both in the creation and debugging of complex data sets. Life itself is a maze of twisty little passages sometimes, and maps are few and far between. Every tool we have is valuable.

In simplicity lies elegance.■

Circle 126 on Reader Service card.

GET THE MOST FROM YOUR VIC-20/C64

CASSETTE INTERFACE
- USE ANY PORTABLE CASSETTE RECORDER
- CONTROLS THE CASSETTE MOTOR
- MAKE COPIES OF ANY TAPE PROGRAM
- SATISFACTION GUARANTEED
- ONLY $34.95 PLUS $1.60 FOR SHIPPING



FULL RS232 INTERFACE
- CONNECTS TO USER PORT
- FULL RS232 CONVERSION
- CONNECTS ANY STANDARD MODEM OR SERIAL PRINTER
- COMES WITH TYPE IN BASIC TERMINAL PROGRAM
- SATISFACTION GUARANTEED
- ONLY $39.95 PLUS $1.60 FOR SHIPPING



ADD $2.50 EXTRA OUTSIDE US, CANADA OR MEXICO
SEND TODAY FOR OUR FREE CATALOG
SEE YOUR LOCAL DEALER OR CALL:
(206) 236-BYTE

OMNITRONIX (Formerly BYTESIZE MICRO TECHNOLOGY)
PO BOX 12309 DEPT. AZ2
SEATTLE, WA 98111

Circle 60 on Reader Service card.

8K in 30 Seconds
for your VIC 20 or CBM 64

If you own a VIC 20 or a CBM 64 and have been concerned about the high cost of a disk to store your programs on, worry yourself no longer. Now there's the RABBIT. The RABBIT comes in a cartridge, and at a much, much lower price than the average disk. And speed . . . this is one fast RABBIT. With the RABBIT you can load and store on your CBM datasette an 8K program in almost 30 seconds, compared to the current 3 minutes of a VIC 20 or CBM 64, almost as fast as the 1541 disk drive.

The RABBIT is easy to install, allows one to Append Basic Programs, works with or without Expansion Memory, and provides two data file modes. The RABBIT is not only fast but reliable.

(The Rabbit for the VIC 20 contains an expansion connector so you can simultaneously use your memory board, etc.)

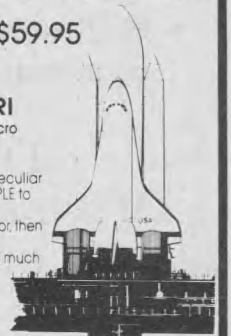


$39.95

MAE NOW THE BEST FOR LESS! $59.95
For CBM 64, PET, APPLE, and ATARI

Now, you can have the same professionally designed Macro Assembler/Editor as used on Space Shuttle projects.
- Designed to improve Programmer Productivity.
- Similar syntax and commands – No need to relearn peculiar syntaxes and commands when you go from PET to APPLE to ATARI.
- Coresident Assembler/Editor – No need to load the Editor, then the Assembler, then the Editor, etc.
- Also includes Word Processor, Relocating Loader, and much more.
- Powerful Editor, Macros, Conditional and Interactive Assembly, and Auto – zero page addressing.

Still not convinced; send for our free spec sheet!



TELSTAR 64 A sophisticated Terminal Cartridge for the 64. Upload/Download — $49.95

MACHINE LANGUAGE MONITOR — Over 20 commands. Cartridge plugs into the 64 — only $24.95

Eastern House
3239 Linda Dr.
Winston-Salem, N.C. 27106
(919) 924-2889 (919) 748-8446

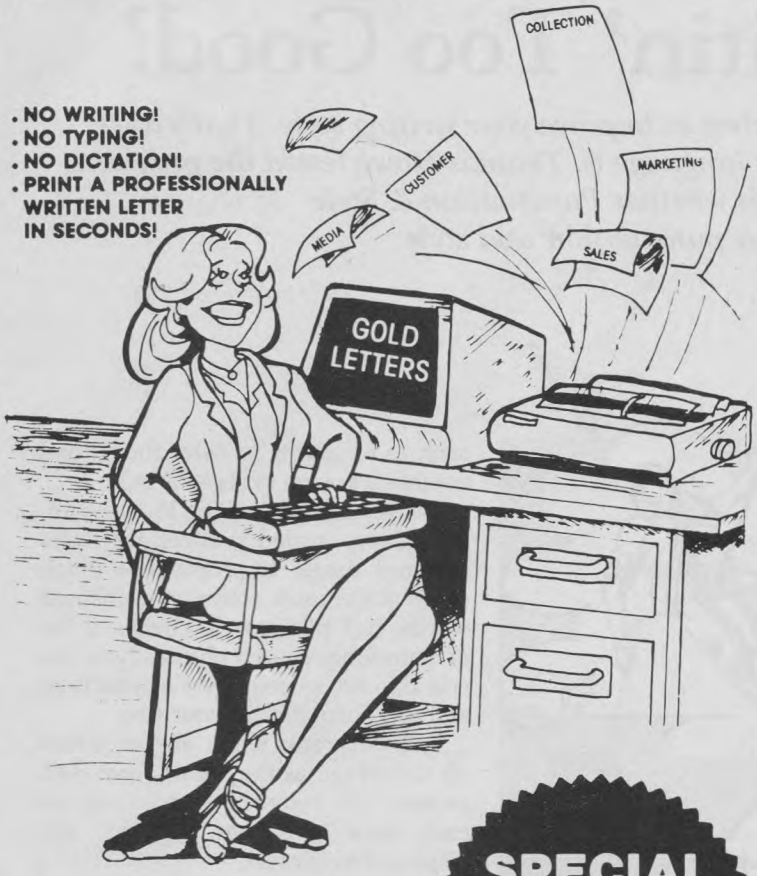
101 Business Letters

Ready to Use... On Disk...

FINALLY . . .

- Save time
- Keep Business correspondence up to date
- Improve company image
- Speed up collections
- Increase mailing response
- Respond promptly to all customer and prospect queries
- Promote new business
- Keep in touch with clients and vendors

. NO WRITING!
. NO TYPING!
. NO DICTATION!
. PRINT A PROFESSIONALLY WRITTEN LETTER IN SECONDS!



SPECIAL
Gold Letters and WordStar™
$395.00

ORDER *GOLD LETTERS* TODAY!

One Hundred and One professionally written business letters on diskette, allowing you to automatically answer all your business correspondence needs.

Twelve major categories are included, covering every conceivable business situation.

No typing needs, because each letter is complete and ready for addressing.

Personal revisions are easy, because Gold Letters is accessible by all major word processing programs.

Ready to use in minutes, with no programming or typing necessary.

Your complete 101 Gold Letters software package includes a 5¼" or 8" diskette, a binder containing hard copy versions of all 101 letters by category, and instructions for using the Gold Letters.

Available in CP/M, MS/DOS and PCDOS.

Price for entire package: Diskette binder, 101 categorized letters and instructions. $159.00

Add $5.00 shipping & handling costs. CA residents add 6% sales tax.

Letter Listing

- 9 credit letters
- 4 marketing letters
- 13 customer relations letters
- 8 employee letters
- 12 contracting products letters
- 6 follow up letters
- 9 sales letters
- 4 media letters
- 7 collection letters
- 2 sympathy letters
- 9 services letters
- 4 procurement letters
- 21 other business letters!

FOR IMMEDIATE DELIVERY CALL 800-922-5555

Visa and MasterCard accepted.

Yes, send me ____ copies of Gold Letters for $159 each.

Enclosed is $ _____

Name _____

Company _____

Address _____

City/State/Zip _____

Telephone _____

Visa/MC # _____

Exp: _____

Mail to:
Data Base Industries
330 W. Felicita Ave., Suite D-6
Escondido, CA 92025
619/480-9616

To order by mail, write to:

Data Base Industries

330 W. Felicita Avenue
Suite D-6
Escondido, CA 92025

Circle 23 on Reader Service card.

You Ain't Writin' Too Good?

Punctuation & Style is a program that claims to improve your writing style. That's a big claim when you consider how intricate our language is. Thomas Howe tested the program and in this article, he tells whether Punctuation & Style really improves your punctuation and style.

By Thomas Howe

"Punctuation & Style is a set of two programs that will catch errors in punctuation and also help you improve your writing style."

This is what Oasis Systems claims in the manual that accompanies its Punctuation & Style package. It's a truly bold claim when you consider the complexities of the English language.

I will try to show you how to customize Punctuation & Style (P&S) and I'll suggest where the program might be most useful.

A word about the English language is in order. English teachers, please spare me the thrashings, but English is one of the most difficult languages to learn.

Have you ever noticed the trouble foreigners usually have learning the new tongue? There are so many exceptions to rules that only a college-educated expert has any chance of using completely correct grammar even 90 percent of the time.

Even our spelling "rules" are almost meaningless at times; e.g., do you ever have trouble with "i" before "e"? Word usage is inconsistent. Words that are incorrect in one place are perfectly OK in others (meaning that phrases generally considered awkward do indeed have proper uses). Words may sometimes be redefined at whim within a given context.

In short, our language is its own worst enemy.

A Monumental Task

The people at Oasis Systems are to be admired for tackling so formidable a task as proofreading your written work.



Every one of us uses a distinctive writing style that identifies our work like a fingerprint. Because we create our own exceptions to the rules at times (is this "creative license"?), this makes the job more difficult.

To be fair, I must state clearly that P&S makes no claim to check for correct grammar, only for certain potential style errors. There is a difference. Grammar and syntax are separate areas of study. The variables are as numberless as a good grammarian is priceless.

Initial Evaluation

Punctuation & Style is made up of two programs. The first is Cleanup.com, which is designed to check for many common punctuation errors. It also looks out for special problems WordStar users may have, such as forgetting to enter the second control-B to turn off boldfacing.

The second program is Phrase.com, which was created to check for errors in word usage. It proposes to catch some of the most commonly misused words and phrases. It checks a list of commonly abused phrases (you can edit this list to your own satisfaction) and compares it with your text.

Both programs show alleged errors on the screen as they work, and both require an interactive response as each error is shown. "Errors" are displayed in context.

My initial reactions were mixed when I first began to use P&S to test my work. The programs are easy to operate and easy to understand. The documentation seems fairly well-written, thought it would have been easier to read if Oasis had set type rather than simply reproduce typed pages. I did come across a few errors in the manual, but none are serious.

The biggest problem I encountered was that the software located too many "errors" in both punctuation and style that were not errors.

I attempted interfacing P&S with texts written using both WordStar and Perfect Writer. In both cases, I gave up and went back to the manual for more guidance. See Fig. 1 for examples of the absurdities I saw.

As shipped, P&S is geared quite conservatively. It is designed to trap every error on its list. It does this quite well. Conflicts occur because of the way some things are entered for various

Address correspondence to Thomas Howe, 255 Flamingo Road, Mill Valley, CA 94941.

word processors.

Cleanup.com drove me bonkers, showing every place that it thought I should have put a space. For instance, commands are entered in Perfect Writer with little, if any, space between them. Stray spaces at the top of a document make the formatter program do strange things.

Speaking of spaces, because the Kaypro II will not microspace on its screen, WordStar inserts extra spaces to justify margins. Cleanup.com flags every one of those spaces as errors.

I ran into a similar problem with Phrase.com in that some of its recommendations border on absurd when seen in context. In proofreading a 12-page article, it found 46 "errors" and required me to study each one. Because my writing style is fairly well-fixed and because I choose my wording deliberately to make certain points, most of those suggestions were inappropriate.

The programs do have some real possibilities, though. It's possible to harness P&S's wildness. You can obtain acceptable usage and results with just a little customization and thought. I'll show you how it's done for better interaction with both WordStar and Perfect Writer.

Customization

Oasis Systems was thoughtful in providing an easy way to customize P&S to suit the needs both of individual writers and various word processors.

Both Cleanup.com and Phrase.com will load and use data files known as "option files." These files are designed to contain changes and special commands you want or need to use.

I experimented a little and constructed option files that produce fairly nice results with both Perfect Writer and WordStar. Phrase.com was still a little disappointing in some ways, but it does what Oasis claims it will do.

The option files are strictly structured and are allowed only a certain number of lines. Each line must contain certain data and nothing else.

Cleanup.opt contains 12 lines and Phrase.opt has nine (though the manual says seven on page 77). Each line controls a different option. Oasis Systems furnishes skeleton customizations for four word processors. See Fig. 2 for the data in the two you are most likely to encounter; Perfect Writer and WordStar. Then I'll show you how to smooth out some of the wrinkles.

Here is the gist of the data contained on each line in each option file. You should consult the manual for more detailed information.

Cleanup.opt

1. Command line switches. Sets things like marking characters, document spacing and file output.

2. Characters that begin a comment line. This line does not print.

3. Soft hyphen characters.

4, 5 and 6. Bracket characters, control characters to recognize.

7. How to mark text that should be ignored (skipped over). This allows you to shut out things like tables and charts.

8 and 9. How to start and include error annotations so they will not be printed.

10. List of errors to ignore.

11 and 12. How to ignore command statements. Especially helpful with Perfect Writer.

Phrase.opt

1. Command line switches. Same as above.

2. Characters legal within words.

3. Soft hyphen characters.

4 and 5. Marking characters.

6 and 7. How to begin and end its own comment statements so they will not be printed.

8. Recognizing lines to be ignored. Generally for WordStar dot command lines.

9. Screen width in number of characters.

Modification Explanation

Let me explain some of the modifications I have made (shown in Fig. 3.) If one of these does not suit you, you can modify it your own way.

Keeping in mind that I generally use double spacing with WordStar and that Perfect Writer command lines cause problems, Fig. 3 shows what you should enter in each option file to cut down the number of false error reports.

In all cases, I have changed the marking characters to the tilde (~). The tilde is chosen because it is rarely used in writing and thus will be easier to search for later when you must remove the marks from the text before printing.

Enter this data exactly as you see it here, except note that the reference numbers in the left column are for reference only and are *not* to be typed. If you use WordStar to edit these, use the nondocument mode. With Perfect Writer, turn off the word-wrap feature by using the "normal" mode.

Once you have completed the job of checking your text with P&S, you must reenter your word processing program and find those pesty tildes. They have to be deleted and your paragraphs reformed prior to printing.

Tailoring P&S for Wordstar.

First, look at the two WordStar option files shown in Fig. 3. Cleanup.opt is set up (with the information in line 1) to read double-spaced documents (both programs are confused by double spacing on the screen unless you warn them this way), marking punctuation errors with a tilde (~).

Line 2 should contain a period followed by a carriage return and

```
NICE : <A MORE EXACT WORD>

This is especially [nice] if you write letters because ~1 proportional fonts
usually have a much sharper appearance.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
VERY : <AVOID>

This batch printing is [very] handy for writing long reports or even books.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
ACTUALLY : REALLY

The lessons are interactive in that you are told to [actually] use the
commands and see what happens.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

REFERENCE : SEE

One tip is in order: ~1 print out the text on the lessons disc for a
[reference] as you work through it.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

Fig. 1. Examples of errors flagged by Phrase.com. The top two are legitimate; the others make no sense in context.

Circle 66 on Reader Service card.

MASTERMIND SPREADSHEETS

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

TEMPLATE OVERLAYS
for use with your
PERFECT CALC.® SUPERCALC®
or MULTIPLAN®
All calculations done for you!!!

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

REAL ESTATE MASTER
$79.00

* Property Record & Balance Sheet
* Monthly Expense & Cash Flow Summary
* Annual Before & After Tax Cash Flow Summary
* Personal Financial Statement
* 5 & 10 Yr. Cash Flow & Sales Analysis with calculation of internal rate of return
* Includes the following NIREB forms:
  - CID B – Property Analysis
  - CID C – Comparative Investment Analysis
  - CID D – Individual Tax Analysis
  - CID G – Excess Depreciation, Net Proceeds
* Plus the following Text Files:
  –Offer to Purchase Real Estate Form
  –Rental Lease Agreement
  –Rental Application Form
* Comprehensive Instruction Booklet

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

1983 MASTERTAX

Basic Forms $39.00
* Form 1040-EZ
* Form 1040-A
* Schedule 1
* Complete Tax Table
* Instruction Booklet

Long Forms $79.00
* Form 1040
* Form 1040-X
* Schedules A, B, C, D, E, and G
* Schedules X, Y, and Z
* Complete Tax Table
* Instruction Booklet

Supplemental Forms $79.00
* Includes all of the corporate forms and other commonly used forms listed below:
  - Forms 1065, 1116, 1120, 2106
  - Forms 2119, 3468, 3903, 4562
  - Forms 4625, 4797, 4952, 5695
  - Forms 6251, 6252
  - Instruction Booklet

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

* All Instruction Booklets available separately for $7.00 each; price can be applied toward subsequent purchase.
* PLEASE SPECIFY COMPUTER, DISK FORMAT, & VERSION
* Dealer Inquiries Invited

TO ORDER – CALL (317) 459-8537
OR WRITE TO

MASTERMIND *computing*
P.O. BOX 2673 • KOKOMO, IN 46902

Check, Money Order, COD, VISA, MC
Add $2.50 for shipping – Ind. res. add 5%

nothing else to mark the beginning of comment lines. Line 3 lists the control characters WordStar uses for soft and hard hyphens. Lines 4 and 5 list the control characters used to turn on and off alternate type faces.

Line 6 is a list of control characters that serve as toggles. These are used in pairs. Cleanup.com will look for the second one when it sees one of these characters and flash an error message if it is not in close proximity. Line 7 should be blank. Line 8 lists a carriage return-linefeed combination. Lines 9–12 are blank for WordStar applications.

Phrase.opt requires only the addition of a D to the commands in line 1 to signal double spacing and changing the marking characters to a tilde in line 4 and nothing in line 5. Except for problems associated with this bear of a language the software must deal with, it will run just fine.

Tailoring P&S For Perfect Writer

It is relatively simple to customize P&S to operate efficiently with Perfect Writer texts. In line 1 of Cleanup.opt, add the command to change the marking character to a tilde. Lines 2–7 are left blank. I couldn't devise any suitable enhancements that were worth the trouble.

Line 8 should contain the command used for comment lines as listed in Fig. 3. Line 9 shows how the comment lines are to be terminated. This is the information Cleanup.com will use to insert its error messages into your text. They will not be printed.

In line 10, it's a good idea to shut off error message number 19 (missing white space) to eliminate problems with Perfect Writer command statements. The command statements do not always follow "proper" English rules for spacing; this tends to jam things together. Optionally, you may also want to shut off error number 6 (too much punctuation) if you have to string together a number of commands, cramming them together in a bunch.

Entering the @ sign in line 11 will cause Cleanup.com to ignore command statements altogether. Use the data in line 12 to tell Cleanup that the statements end with one of the right hand enclosures or a combination of

ORIGINAL OPTION FILES -- WORDSTAR

	WS.CL	WS.PH
1	F	*
2	.	´
3	c^c_	c^c_
4	cA	[
5	cN	]
6	cScBcDcXcVcTcY	..(space)
7	*	cMcJ
8	..(space)	.
9	cMcJ	80
10	*	
11	*	
12	*	

ORIGINAL OPTION FILES -- PERFECT WRITER

	CL.PW	PH.PW
1	FM#	´
2	*	*
3	*	[
4	*	]
5	*	@COMMENT(
6	*	)cMcJ
7	*	*
8	@COMMENT(	80
9	)cMcJ	
10	*	
11	*	
12	*	

Fig. 2. A listing of the canned option files shipped with P&S. They display the skeleton of customization. Blank lines are marked with an asterisk.

carriage return-linefeed. These changes cause command statements to be passed over, allowing the program to concentrate on actual errors in the text.

The Final Evaluation

Once you've completed these simple customizations to the option files, P&S will perform fairly well, allowing for some limitations.

P&S is competent in checking for punctuation errors. This aspect of grammar and syntax does not have an excessive number of variables, and you can be reasonably sure the program is on target when it flags an error.

The most common punctuation error it will miss (through no fault of the program—there are too many opinions to declare a law) is the question of more or fewer commas. That is a matter of taste for which there is little general agreement.

The matter of checking for overused phrases is a completely different animal—yet to be tamed. Here is where the variables built into the language seem ready to overpower any microcomputer available today. Phrase.com has a list of about 500 commonly misused words and phrases as its reference for potential problems. Remember once again that this package is not designed to check for grammatical errors.

The manual correctly advises you not to take advice on the overuse of phrases too literally because simple substitutions rarely work. If there is truly a problem with a word or phrase (it pointed out correctly that I tend to overuse the word "very"), you may have to rewrite the sentence. That may not be a bad idea sometimes, but there are many times that you have chosen a particular word or phrase because it conveyed the exact shade of meaning you intended. Don't change those!

Overall, Punctuation & Style delivers most of what it promises. It should be helpful if your command of punctuation and word usage is average or weak. If you're confident of your language skills, save your money.

You also have to recognize that this is not a complete grammar checker that can discern participles and infinitives and such. Therefore P&S is limited to a narrow range of errors to search for.

Perhaps when we have 128-bit micros, it will be possible to do this job adequately.■

CUSTOM OPTION FILES FOR WORDSTAR

	CLEANUP.OPT	PHRASE.OPT
1	FD@M~	PD
2	.	'
3	c^c_	c^c_
4	cA	~
5	cN	*
6	cQcWcEcRcOcHcFcGcMcScBcDcXcVcTcY	..(space)
7	*	cMcJ
8	..(space)	.
9	cMcJ	80
10	*	
11	*	
12	*	

CUSTOM OPTION FILES FOR PERFECT WRITER

	CLEANUP.OPT	PHRASE.OPT
1	FM~C	P
2	*	'@
3	*	*
4	*	~
5	*	*
6	*	@COMMENT(
7	*	)cMcJ
8	@(COMMENT	*
9	)cMcJ	80
10	19	
11	@	
12	))]cMcJ	

Fig. 3. Punctuation & Style's option files customized for WordStar and Perfect Writer. Asterisks mark lines that should be left blank in the option files.

Circle 386 on Reader Service card.

'PUBLIC DOMAIN'™ — SOFTWARE —

Supporting all COMMODORE computers
Written by users, for users
★ GAMES ★ UTILITIES ★ EDUCATIONAL ★

VIC 20™

collection #1 – collection #2 – collection #3
collection #4 – collection #5 – collection #6
70+ programs per collection – Tape/Disk – $10.00

VIC COLLECTION #6
3D-Maze ● A or An Quiz ● Alarm Quiz ● Alpha Sort Amortize ● Banner ● Big Six ● Bio Printer ● Breakout (J) Budget-Mgr ● Bumblebee ● Buzzword ● Cascades CBuff Peek ● CBuff Save ● Colour Pinball ● Computer Fix Coverage Predict ● Craps ● Crytogram ● Deepspace Density ● Easter Dates ● Electric Cost ● F.I.C.A. Tax Fast Sort ● FFT Calc. ● Firing Tank ● Freq. Coord. Geog. Spell Game ● Guerchen ● Hi-Res ● Job Jar L Pad Design ● Labrinth ● Letter Reco ● Marston City Rvd Match the Number ● Math Dice ● Math Fact Drill Math Test ● Math Time ● Maze Maker ● Merry Christmas Millionaire ● Mosaic ● Multiply Tables ● National Parks Nicoma ● PCB Printer ● PI Network Desig ● Quartic Quiz ● R-S-P ● Rebound Hockey ● Revenge Inst. Revenge Prog. ● Rnd. Graphics ● Rolling Sticks ● Rom Aid Shopping List ● Simon ● Slide Voice ● Snoopy Hires Spelling Aid ● Stopwatch ● Sunrise/Sunset ● Sym T Atten Tennis 3 ● Too High-Too Low ● Typing Test ● Vectors Vehicle Cost ● VIC Orbit ● VIC Symphony ● Wumpus Inst. Wumpus Prog. ● Zero Formula

COMMODORE 64™

64 collection #1 – 64 collection #2 – 64 collection #3
64 collection #4 – 64 collection #5
25+ programs per collection – Tape/Disk – $10.00

COMMODORE 64 COLLECTION #5
GAMES — Alien Capture ● Auto Rally ● Dominoes ● Explore Lost Gold Adv. ● Niche ● Owari ● superman ● Zone X UTILITIES — Accounting Test ● Annuity ● Average Growth Building Costs ● Buy/Sell ● Change Disk Name Cross Word ● Data Search ● Elec. Use ● Finance ● Growth Irr. Cash Flow ● Load Calc. ● Real Estate cost ● Rent or Buy EDUCATIONAL – A or An ● Arrow Facts ● Big Math ● Element Chart Eliza ● Europe ● Hang Math ● Linear Prog. ● Loops Marblestar ● Math Facts ● Number Match ● World Quiz

PET® / CBM®

5 Utility – Tapes/Disks – $10.00 each
11 Game – Tapes/Disks – $10.00 each
6 Educational – Tapes/Disks – $10.00 each

DINSET™: Reset Switch

Works on Vic 20 or Commodore 64 – $5.00

All prices include shipping and handling.
CHECK, MONEY ORDERS,
VISA and MASTERCARD accepted.

For A Free Catalog Write:

Public Domain, Inc.
5025 S. Rangeline Rd., W. Milton, OH 45383
10:00 a.m. - 5:00 p.m. EST – Mon. thru Fri.
(513) 698-5638 or (513) 339-1725

VIC 20™, CBM™ and Commodore 64™ are Trademarks of Commodore Electronics Ltd.
PET® is a Registered Trademark of Commodore Business Machines, Inc.



Get Into MICROCOMPUTER REPAIR

Train at home in spare time... No previous experience needed

Sales of small computers are running over a billion dollars a year. That's why a whole new business is starting up—devoted entirely to small computer repair. And right now is the time to get in on the ground floor—either working for someone else or in your own computer repair business.

Start making money in electronics

No need to quit your job, change your daily routine or take time from family responsibilities. And you don't waste time going to and from class because you train at home in spare time. The ICS Microcomputer Repair Course is designed for beginners—people with no previous experience who want to get started fast. And you should be ready for an entry-level job repairing small computers even before you finish this course.



You receive microprocessor trainer, digital V.O.M. and much more included with course.

Experts show you what to do... how to do it! We start you fast with the basics, and everything is explained in easy-to-understand language complete with plenty of diagrams and drawings

GET INTO SMALL COMPUTER REPAIR

12V **SEND FOR FREE FACTS!**

ICS SINCE 1891 **School of Computer Training,** Dept. DL014
Scranton, Pennsylvania 18515

Send free facts and color brochure telling how I can get into computer repair at home in my spare time. No obligation. No salesman will call.

Name _____ Age _____
Address _____
City/State/Zip _____

GP-7 Grafbar: A New Deal in Digitizers

Digitizers no longer cost several thousands of dollars—the price has dropped dramatically. Science Accessories' GP-7 Grafbar, one example of today's low-cost digitizers, offers compatibility and is simple to assemble.

By K. David Steidley

Since only about two percent of microcomputer owners have a digitizer, you may not have had the opportunity to see one in use. However, they are easy to use and can be vital in a variety of situations.

As you can imagine, there is a host of engineering and scientific applications where it is necessary to find the various x,y coordinates of, say, a data curve, a map or an architectural drawing. The manual labor required to gather such coordinates can be extensive and often inaccurate, but, with a good digitizer, the resolution will be dominated only by the care of the human operator—not the hardware.

Since dozens of points per second can be entered into a microcomputer system, a digitizer's speed and accuracy opens up exciting possibilities in both graphic analysis and interactive graphics.

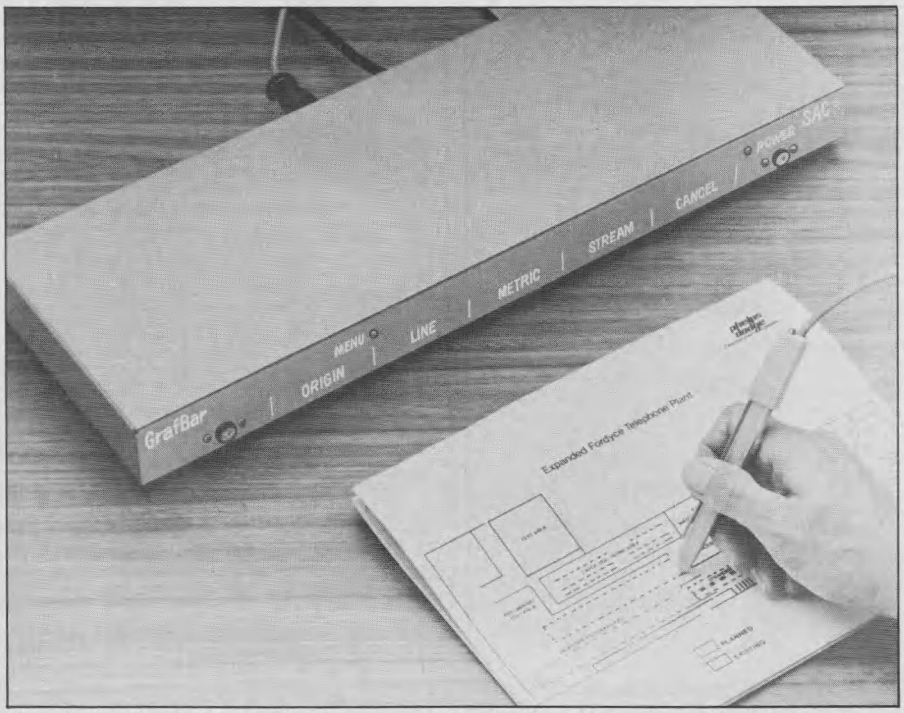
In the bad old days, digitizers were priced at several thousands of dollars; now they're obtainable for less than a thousand dollars and are compatible with many microcomputers. The GP-7 Grafbar, from Science Accessories Corp. (970 Kings Highway West, Southport, CT 06490), is priced at $865, and it's a gem of a unit.

The Shock of Compatibility

Even with extensive assurances from the manufacturer that its digitizer is completely compatible with a serial RS-232C interface, it was with some trepidation that I unpacked the unit. I've been burned all too often with printers and software that were "compatible" only after extensive frustration.

Assembling the unit was simplicity itself. I connected the stylus (see photo), the power cord and my RS-232C cable to the communications port on my Intertec Data Systems Superbrain. With the digitizer's power on, you can depress the tip of the hand-held stylus over the point you wish to digitize and hear and see the small spark that is generated. The ultrasonic component is detected by the two microphones on either side of the device; these microphones are used to range, or triangulate, the stylus's position.

With that much assurance that the unit was operational, I used Intertec's input port "configure" program to match the bit rate, parity and stop bits that the digitizer manual claimed



The Model GP-7 Grafbar digitizer by Science Accessories Corp. Note stylus and built-in menu functions. (Photo courtesy of SAC.)

Pin	Function
1	Protective Ground
3	Transmit Data
4	Request to send
5	Clear to send
7	Signal ground

Table 1. Pins and functions of RS-232C interface.

Address correspondence to K. David Steidley, Ph.D., 50 Baltusrol Way, Short Hills, NJ 07078.

I must apologize—
the GP-7 Grafbar
is compatible

the unit was normally shipped with. (Obviously, I was still paranoid at this point.)

I then used the CP/M operating system command PIP Test.Dat = OUT: and was delighted to see a series of coordinates appear on my screen as I used the digitizer. I used control-Z to exit and found that I had indeed created a file named Test.Dat and that it contained the desired points. This file can be accessed with either a word processor or Basic (or any language, for that matter) with only a little bit of effort.

What I figured would take several hours ended up taking about ten minutes, so I must apologize to the folks at Science Accessories Corp. for thinking all of those dark thoughts. The GP-7 Grafbar *is* compatible!

Theory of Operation

The stylus of the GP-7 Grafbar generates a spark with an ultrasonic frequency component each time you press it down. This mechanical depression starts an electronic counter. The sound is received by point microphones on either side of the unit, is converted to an electrical signal and then is filtered and amplified. This reception stops the counter.

Next, an eight-bit microprocessor (Motorola 6802 AMI with two 6821 supporting devices) acquires the signal and reads the counter. It converts this time to the distance from the digitizer point to each of the microphones and then to Cartesian coordinates by simple geometry. The format is presented for either a serial or parallel transmission.

The system can digitize up to 35 points every second in Cartesian coordinates. The active area in which you may digitize measures 18×24 inches and is centered in front of the bar with a two-inch menu area above the active area reserved for other functions.

The RS-232C interface can use five lines (see Table 1), but only the grounds and the transmit data line need be used. Data is sent in the standard seven-bit ASCII format, and there is an internally located seven-pole DIP switch for selecting the number of stop bits (one or two), parity (off, even, odd) and bit rate (110, 300, 600, 1200, 2400, 4800, 9600 or 19,200).

Note that, if you change the DIP switches, the ac power must be turned off and on to latch the new switch settings into memory. Be careful with the bit rate setting, because the switches are not physically positioned one after another, but are in positions 2, 3 and then 5. The serial output format is a sign (+ or −) followed by four digits for x, plus another sign followed by four digits for y, then a

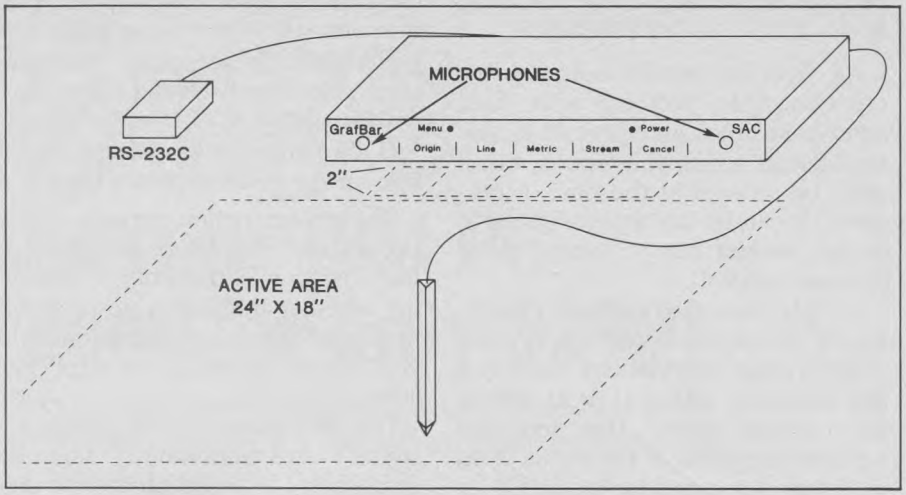
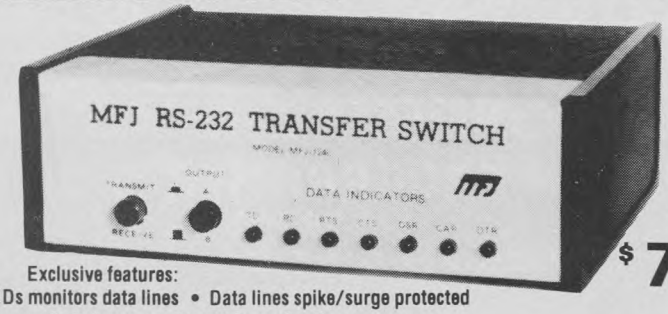


Fig. 1. The areas reserved for the menu functions and active area are displayed for the Grafbar digitizer.

Circle 316 on Reader Service card.

A WHIZ of a Switch

RS-232 Transfer Switch lets you switch your computer between printers, modems, terminals, any RS-232 peripherals. No plugging and unplugging cables. Like having extra ports. Choice of 8 models.



Pictured: MFJ-1240 1 in-2 out 7x2x6 in.

$79.95

Exclusive features:
- **LEDs monitors data lines**
- **Data lines spike/surge protected**
- **Switch reverses transmit-receive lines**

These multi-function RS-232 transfer switches let you switch between peripherals, test for data and line failure, protect data lines and use as null modem for less cost than a switch alone.

Switches 10 lines (2, 3, 4, 5, 6, 8, 11, 15, 17, 20). LED data/line indicators monitor lines 2, 3, 4, 5, 6, 8, 20. Metal oxide varistors protect data lines 2, 3, 7 from voltage spikes and surges. Push button reverses transmit-receive lines. PC board eliminates wiring, crosstalk, line interference.

CHOOSE FROM 8 MODELS
- **MFJ-1240,** $79.95, 1 input - 2 outputs.
- **MFJ-1241,** $99.95, 2 inputs - 2 outputs.
- **MFJ-1242,** $119.95, 2 inputs - 3 outputs.
- **MFJ-1243,** $119.95, 1 input - 4 outputs.
- **MFJ-1244,** $139.95, 3 inputs - 3 outputs.
- **MFJ-1245,** $169.95, 3 inputs - 5 outputs.
- **MFJ-1246,** $199.95, 5 inputs - 5 outputs.
- **MFJ-1247,** $99.95, 1 in-2 out (switches 20 lines)

Order from MFJ and try it. If not delighted, return within 30 days for refund (less shipping).

One year conditional guarantee.

Order yours today. Call toll free 800-647-1800. Charge VISA, MC or mail check, money order for amount indicated plus $4.00 each shipping.

CALL TOLL FREE ... 800-647-1800

Call 601-323-5869 in Miss., outside continental USA, tech/repair info. Telex 53-4590 MFJ STKV.

Write or Call for FREE Catalog

MFJ ENTERPRISES INCORPORATED

921 Louisville Rd., Starkville, MS 39759

carriage return and a line feed: that is, +-XXXX +-YYYY(CR)(LF).

An eight-bit parallel output using the Centronics protocol with three handshake lines and ground is also available as a firmware option, but it must be ordered at the time of purchase. It can be factory-configured to output packed binary, binary-coded decimal or ASCII.

In the so-called stream mode, where the stylus continuously fires without your intervention, there is a flag character, either U or D, before the carriage return that indicates whether the point of the stylus is up or down. An overflow indication of 9999 9999 is sent when you are out of the active area.

Operation

Since the Grafbar does not use a tablet, it lets you digitize from a video screen, a backlit film or any flat surface. An area reserved for a five-choice menu extends about two inches from the front of the device (see Fig. 1). By touching the stylus in any of five areas (origin, line, metric, stream or cancel), you can activate the Grafbar's firmware to perform these functions. A green light comes on to remind you that you have enabled one of these options.

The natural origin (x=0, y=0) of the Grafbar coordinates system is the upper left-hand corner of the active area. Thus, all xs are positive and all ys are negative, since you are in quadrant IV.

If you wish to temporarily place the center of the coordinate system elsewhere for your application, you can first touch the origin option, then the point you wish to have as the new origin (0,0). Subsequently, the value of all points digitized and transmitted will be relative to this new origin and will be correct with respect to the sign for the quadrant being used.

The stream option permits digitizing without depressing the stylus. A flag character is transmitted, indicating whether the pen is up or down. Any applications program you write will have to deal with this extra character.

The line menu option forces the stylus to fire continuously when depressed; it's a logical choice for digitizing contours or data curves that are changing quickly. To return to point mode, tap this area again.

The metric option outputs data to the nearest tenth of a millimeter instead of to the nearest one-hundredth of an inch. To revert to English units, tap this option again. The cancel option returns all functions to their power-up default values: English units, point-by-point mode digitizing and a natural origin.

Since the velocity of sound varies directly with temperature (and to a small extent, humidity, but not pressure), any changes in the ambient temperature away from 74 degrees F. factory calibration will alter the absolute (but not the relative) accuracy of the digitizer, which is +-.1 percent. If you can tolerate an approximate one percent error, you can operate the unit between 64–80 degrees.

Units shipped by the time you read this will have a correction routine built into the firmware so that an automatic temperature correction is done before transmission. You will be supplied with a plastic template to help do all this.

Options Available

You may wish to consider a few hardware and firmware options besides the serial vs parallel interface. At base price, Science Accessories Corp. ships the unit with a stylus that contains a ball-point pen cartridge (with or without ink, as you desire). For an extra $35, you can have this replaced with a plastic, needlepoint, nonscratching stylus in either white or black plastic to color-contrast with the material you are digitizing.

For high accuracy, you can order a button cursor with crosshairs instead of the stylus. This is an extra $50. The company also supplies a ten-foot RS-232C interface cable for $75 (readers of this magazine could probably find one for less).

For those who prefer to use metric units, you may order the Grafbar with the metric mode as the data-output default. If you wish the origin to default to another point in the active area, you should specify this when you order. Neither option costs extra.

Conclusion

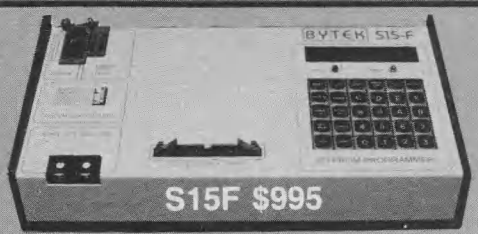
This device is well-engineered and reasonably priced for what you get, has a 90-day warranty and a no-nonsense engineer's manual with complete electrical schematics and is backed up by an established firm.

If you're in the market for a digitizer, the Grafbar GP-7 is a must for your consideration.■

Circle 396 on Reader Service card.

EPROM PROGRAMMER & UV ERASER FOR THE 80's
S15 PROGRAMS OVER 300 DEVICE TYPES
MOS (8K - 256 K, SINGLE & 3 VOLTAGES) BIPOLAR PROMS, 40 PIN MICROS

- Stand Alone
- 256K Buffer (200 ns)
- Integrated keypad
- EPROM simulation
- Fast algorithm
- Power down sockets
- Temp compensated Ref. voltages
- 16 formats & 8 baud rates
- Auto-user friendly-mode



S15F $995



BUV-IIA $66.50
- Heavy duty
- Safety switch
- UV indicator

BUV-IIB $95.50
- Heavy duty
- Timer
- Safety switch
- 110/220 voltage

OVER 26 FUNCTIONS
- Edit
- CRC Check
- Block Move
- Over Program
- Insert
- Delete
- 16 Diagnostic Functions
- And More!

OTHER COMPLETE SYSTEMS

S15R (remote)	$695
S15P (4 key)	$795
S15B (bipolar)	$895
S15G (gang)	$1095

BYTEK
COMPUTER SYSTEMS CORPORATION
(305) 994-3520
4089 S. Rogers Circle #7, Boca Raton, FL 33431

DoubleDOS

Makes your IBM PC twice as good for only $299!

Your IBM PC can perform even better than IBM intended. Introducing DoubleDOS—the SoftLogic Solution that lets you run two programs at once—with no down time. Who said you can't do two things at once?

This magical solution to better productivity is introduced at only $299. ***Plus—there's no need for expensive additional hardware or software changes in your PC.*** DoubleDOS works with DOS 1.1 or 2.0, and your existing DOS software.

To order DoubleDOS or for more information, call SoftLogic Solutions toll free at 1-800-272-9900, or mail in the coupon below immediately. Ask for DoubleDOS at your local personal computer dealer.

DoubleDOS—and the IBM PC—a solution that's twice as sweet as a rose!



SoftLogic SOLUTIONS
530 CHESTNUT STREET
MANCHESTER, NH 03101
1-800-272-9900
In NH call 627-9900

DoubleDOS works with DOS 1.1 or 2.0, and your existing DOS software.

ORDER NOW!
Rush me DoubleDOS.

☐ I'VE ENCLOSED $299 (CHECK OR MONEY ORDER)
☐ CHARGE TO MY VISA/MASTERCARD (CIRCLE ONE)
ACCOUNT NUMBER: _____
EXPIRATION DATE: _____ M
SIGNATURE: _____
NAME _____
STREET _____
CITY _____ STATE _____ ZIP _____
SEND TO: SOFTLOGIC SOLUTIONS, INC.
530 CHESTNUT STREET • MANCHESTER, NH 03101

MasterCard VISA

PRODUCT PREVIEW

Apple's Back with the Mac



By Keith Thompson, Editor-in-Chief

If you were waiting for a Macintosh that would be another PC-compatible, run CP/M or MS DOS and splash a palette of color on a screen, you'll be disappointed.

The introduction of Apple's Macintosh at the company's annual meeting in January reveals not only a little Lisa, but a machine that has improved upon the Lisa's weaknesses.

In Macintosh, you have a 32-bit-architecture machine that embodies Lisa technology in a single box. Unlike Lisa, though, the Macintosh is fast and promises plenty of software—and it's considerably more affordable.

Not a Big Mac

The unit itself has a 10 × 10 footprint and is 13 5/8 inches high, allowing it to take its place unobtrusively on a desktop.

The Mac contains a built-in nine-inch diagonal monochrome monitor that is bit-mapped (512 × 342 dots). A 400Kb 3½-inch microfloppy disk drive is an integral part of the machine. There are no "slots" that are the hallmark of the Apple II (and that spawned entire industries of their own). Instead, Apple has chosen to provide a machine that is practically hardware-complete by building in most of the hardware expansion that is optional with slotware on the Apple II.

The unit has a built-in real-time clock that, in addition to time-stamping file directories, is capable of interval and event timing.

The limited number of I/O ports are located in a row on Mac's back. There are two identical serial ports (accepting DB-9 connectors) that can be configured for both the RS-232C standard and the faster RS-422.

Through these ports, connections can be made to a printer (the Apple Imagewriter is the only one supported right now), modem or networking system. There is a sound connector (via a standard miniplug) that will allow up to four-channel sound. Next to the mouse connector is a socket accepting a DB-19 plug that is assigned to external mass storage and uses either the optional Apple microfloppy disk drive or a third-party hard disk.

A Powerful Inside Job

The real power lies within the Macintosh itself. There are two basic boards—the analog (containing power supply, speaker and so on) and digital. At the core of the digital board is the MC68000 32/16-bit CPU, which operates at 8 MHz.

Surrounding the chip is 128Kb of RAM and 64Kb of ROM. Skeptics of the somewhat limited RAM accommodations should realize that within the ROM are more than 500 system calls, making program coding efficient and speedy.

The ROM contains the Mac operating environment, which allows you to

Address correspondence to the author at Microcomputing, *80 Pine St., Peterborough, NH 03458.*

use pull-down menus, multiple windows and other Lisa-like features in your own programs.

The Mac's keyboard is nearly identical to that of Lisa, with the exception of an optional numeric keypad. Typical of late Apple keyboards, it has a solid feel and can be used heavily without fatigue. Its 58 keys generate many special characters in addition to the usual complement of ASCII characters.

The keyboard is connected to the main unit via a coiled cable with modular plugs at each end. The optional numeric keypad attaches in daisy-chain fashion from the rear of the keyboard unit.

The other appendage is the mouse that connects to the rear of the computer. Of the many versions of the mouse being used—one-, two- or three-buttoned—Apple maintains that its one-button mouse is easiest to learn.

A computer can be only as good as its software. Perhaps learning from its own bad experiences as a software vendor, Apple has stated that it will rely on third-party software to supply Mac users with what they demand.

Apple has scheduled the release of a limited number of software packages this year, including MacWrite and MacPaint. These programs are excellent for showing off the Mac's Lisa-like technology. MacTerminal, scheduled for release in the next month or so, will support the Apple Modem that was announced last fall.

Programmers will have to wait until spring for MacPascal and MacAssembler/Debugger. Look for MacBasic and MacLogo in late summer or early fall. MacDraw and MacProject (patterned directly from similar Lisa programs) should be out sometime this spring.

Apple wants these programs to get users running on the Mac and to give programmers the tools for further pro-

A Capsule Look At Apple's Macintosh

Manufacturer
Apple Computer, Inc., 2025 Mariani Ave., Cupertino, CA 95014

Price
$2495; includes owner's manual, system disk, blank disk, power cord, learning tape and disks.

Standard Features
MC68000 (8 MHz) CPU with a 32-bit internal architecture and a 16-bit external data path; 64Kb ROM, 128Kb RAM; real-time clock with software system on/off control, interval and event timing, COPS processor and battery backup; RS-232C and RS-422 serial AppleBus connections; four-channel sound mini-plug connector; 400Kb internal drive; 3½-inch Sony disk drive; one-button design mouse.
Power Requirements: 110 VAC and 60 W max.
Weight for total unit: 20 pounds, including keyboard and mouse.

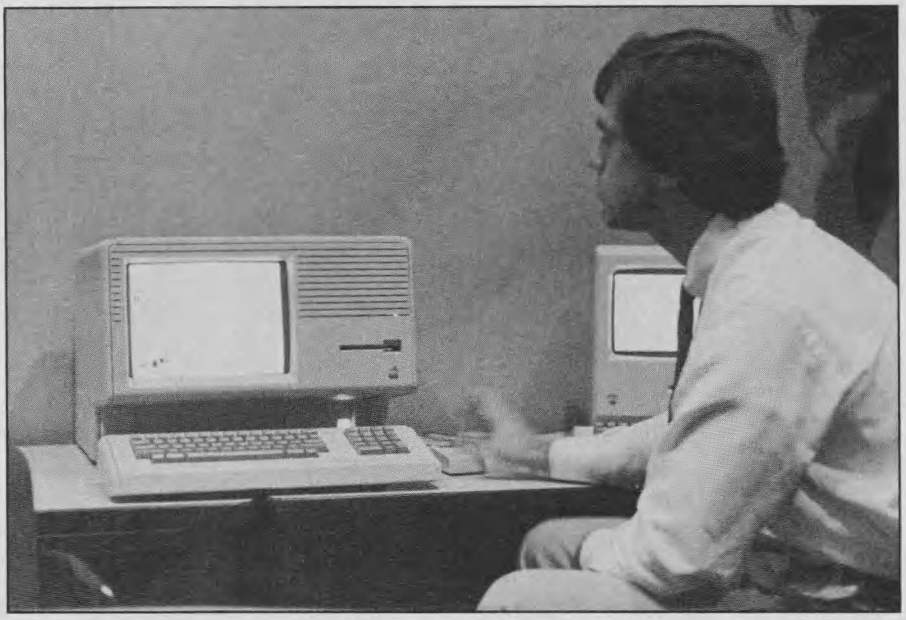
Display
Nine-inch diagonal screen; full-screen bit-mapped 512 lines by 342 dots; brightness adjustment control.

Keyboard
Detached, standard typewriter-style; n-key rollover; sculptured keytops: textured, non-slip, nonglare; full ASCII character set with special characters; numeric keypad option.

Hardware
Imagewriter $550; External Disk Drive $395; Modem 300 $225; Modem 1200 $495; Numeric Keyboard $99; Security Kit $49; AppleLine $1300.

Software
MacWrite/MacPaint will be available for free until May 3, $195 after May 3; Macintosh Pascal $99*; MacTerminal $99*; MacProject $125**; Macintosh Logo $99**; MacDraw $125**; MacAssembler/Debugger $99**; Macintosh Basic $99**.

* available first quarter of 1984
** available second quarter of 1984



A demonstration of the Lisa 2 (note the 3½-inch microfloppy disk drive) running Macintosh's MacPoint.



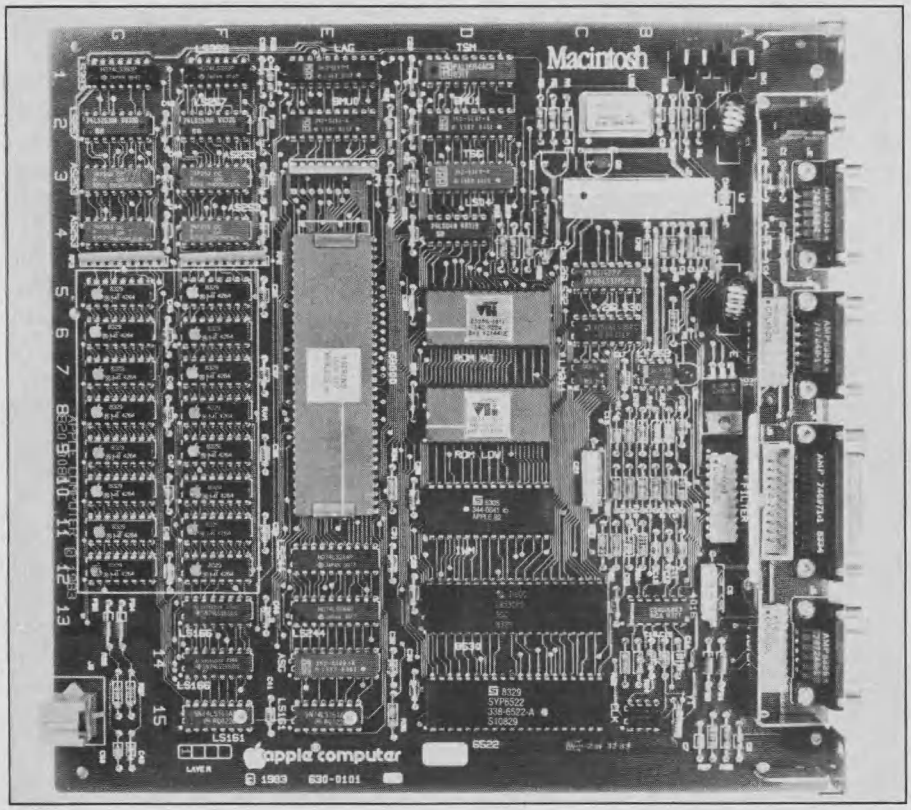
The Macintosh keyboard is essentially the same as the Lisa's without the numeric keyboard.

gram development. Also encouraging is the fact that Apple is keeping the price of most these packages at about $99.

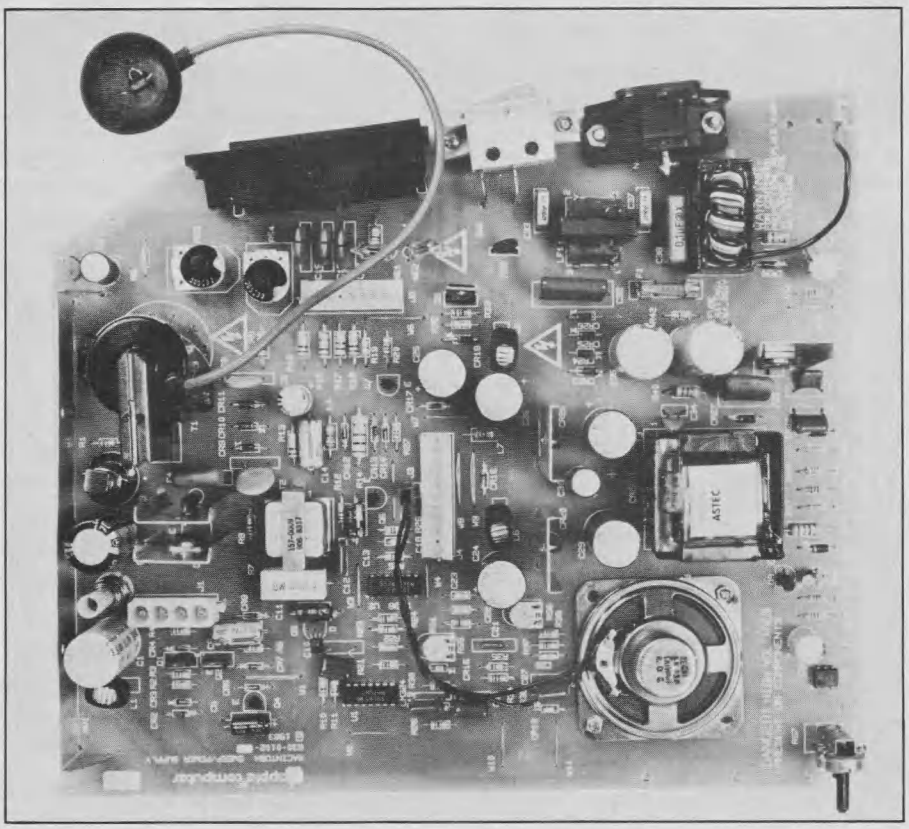
We are told that more than 100 software developers have been approved to adapt or create software for Mac. Scheduled for imminent release are special versions of Microsoft's Multiplan, Lotus's 1-2-3 and, by mid-year, Stoneware's Advanced DB Master. Software is also being readied by Software Arts, Personal Software, Chang Labs and Hayden Software.

These vendors, among others, have had special support from the Lisa/Mac software teams to assist in adapting as many popular application programs as possible for release soon. Unlike the Lisa, the Mac is being offered to software developers as a completely "open" system. Apple will not only supply developers with a three-volume manual—"Inside Macintosh"—but is offering a one-week course to advanced programmers at Apple headquarters in Cupertino, CA.

Since June 1983, Apple has made development tools available that allow programmers to use the standard Lisa-like user interface functions, such as mouse-based editing, multiple windows, pull-down menus, and cut and paste—for fast editing, development and program modification.



The Macintosh digital board has fewer ICs than the IBM PC monochrome board. The heart of the system is the MC68000 in the center.



The Macintosh analog board.

Mac's Multiple Markets

Apple anticipates multiple markets for the Macintosh. First, there are some 25 million "knowledge workers"—those who manipulate information every day on the job. Only a small percentage of these workers have become involved with computers.

Steve Jobs, chairman of Apple Computer, Inc., imagines the office of the '80s with a telephone and Macintosh on every desk.

The other major market is the college student. Apple expects that the college freshman will tote his Macintosh to college, making the electric typewriter a tool of the past.

The Mac carrying case, incidentally, will carry an entire Macintosh system. It is well-constructed with heavy padding and reinforced seams. While the case makes the computer easy to lug around, I couldn't help but frown at Apple's picture of someone riding his bike with his Mac bouncing around in the front basket!

On the Road . . .

The story about how the Macintosh is manufactured is interesting.

Jobs and other Apple officials toured computer factories around the world. They then designed and implemented one of the most advanced robotic manufacturing facilities in the world. Using a human workforce of about 100, the plant will produce a

Macintosh every 27 seconds!

Lisa's Sister

While the world was awaiting the introduction of the Macintosh, Apple was busily reworking its original Lisa to produce improved Lisa technology—the Lisa 2.

The Lisa 2 is significant not only because of the obvious improvements to the original design, but because the Lisa and Macintosh form what has been dubbed by Apple as the "Apple 32-bit Family." The Lisa 2 has the same enhanced Lisa performance as the Macintosh.

Lisa 2 is also aggressively priced to bring it into a range where Lisa should have been a year ago. This new offspring features an integrated 10Mb Winchester disk. The basic machine has 512Kb of memory that can be expanded to 1Mb. It has single 3½-inch 400Kb microfloppy built into its front that will run Macintosh software.

It will be marketed as the cornerstone machine in an office environment that could include numerous Macintoshes.

Each Lisa 2 and Macintosh has built-in networking circuitry that, when connected to each other via cable (about $25 per node), will access the Lisa 2's hard disk file, making information transfer possible. Linking the machines together will also provide shared services, such as with Apple's planned laser printer and 74Mb hard disk.

The Lisa 2 is also equipped with expansion slots that could support multiple environments such as CP/M, MS DOS or Unix.

Lisa 1 Not Forgotten

With so much talk about the Apple 32-bit family, the company is concerned that Lisa 1 owners be well-served as the Lisa technology is advanced. At a nominal cost, Apple will supply upgrade enhancement kits for all Lisa 1s. Apple has developed "spring software" that will speed up the sluggish software that has impaired the acceptance of Lisa over the past year.■

Another New Apple: III Plus

In 1982, when Apple Computer, Inc., tried to improve on its industry-leading Apple II, the result was hardly immediate success. The Apple III had defects that forced a recall; when corrections were made, though, the Apple III was ready to take its place in the business/education field.

Now the III has its own follow-up: the Apple III Plus.

In the III Plus, Apple has incorporated several improvements—most notably its Apple IIe-style keyboard with repositioned cursor control keys and a delete key. In addition, an interlace video mode that doubles the screen resolution of text and graphics has been added.

Other adjustments in the III Plus include:

- A clock/calendar function that works with business software programs;
- A redesigned main logic board;
- Improved peripheral ports, which are standard DB-25-pin connectors, on the back panel;
- Modified slot housings for easier insertion and removal of peripheral cards;
- Revisions of the Sophisticated Operating System, SOS 1.3, and system utilities that support the hardware changes.

The III Plus is 100 percent compatible with Apple III software. In addition, more than 1500 CP/M-based programs will run on the III Plus when it's equipped with a Softcard III.

The Apple III Plus carries a price tag of $2995.

Circle 98 on Reader Service card.



Flight Form protection for the Apple II with 2 drives — about $250

"Travel Insurance"

Here's a little travel insurance for you "computer commuters." The Flight Form case — shown smugly at left — is designed to hold and protect your delicate computer hardware from the pitfalls of travel and pratfalls of handling.

On the outside, tough ABS plastic laminated to one-quarter inch plywood keeps even the cruelest elements from reaching your hardware. Inside, luxurious high-density foam cradles your computer in utter safety and security. An extruded aluminum frame and twin steel hasps makes the protection complete.

A Flight Form case will insure that your high-tech hardware won't become lo-tech junk when you move or travel. Available for most major brands, and custom orders are welcome. Call Glenn Stenson at (206) 365-5210, and get a strong case for insurance. Cases, Inc., 13102 Stone N., Seattle, WA 98133.

Cases, Inc.

Apple II a registered trademark of Apple Computer, Inc.

Give the Osborne a Break (Key)

If your Osborne's modem port has you feeling down, the Osbreak (from Image Sales) will perk you up. The product provides two needed features for the Osborne 1—a break key and a way to use the computer's modem port.

By Tim R. Norton

Have you ever felt cheated when you think about your Osborne 1 modem port? Especially when you look at the price of Osborne's modem that uses that port?

Don't get me wrong, the Osborne modem looks like a good piece of equipment and I'm sure the software works just fine. However, my inexpensive Radio Shack modem and the communications program OTERM303 work so well that I can't see paying a higher price.

My problem is that I have an old letter-quality serial printer that I want to connect to my Osborne I, but the modem takes the serial port and the modem port just sits there. The Osbreak, from Image Sales, changes that and solves the problems caused by the missing break key on the Osborne 1.

The Osbreak, from Image Sales (Suite 200, 2442 N. W. Market Street, Seattle, WA 98107), is a small box, measuring approximately 3×4¼×¾ inches, which fits in the disk pocket of a tan case but must be used externally with a blue unit. It has two ribbon cables; one connects to the modem port and the other has an RS-232C connector for the modem. A small button on the box is the break key, the source of the name Osbreak.

The break key doesn't send an ASCII character; it sends a special signal. It lets the host computer know when you want to interrupt or break work in progress that usually produces more output than anticipated. I use it when I'm connected to the time-sharing system (TSO) at work running on an IBM mainframe.

Even if you don't need the break key, $60 is not a bad price to pay for an additional serial port. OTERM303 works fine when it's set up to use the modem port. Image Sales even provides the listing of a program to select the modem interface if you don't have OTERM. For ten dollars Image Sales will send a floppy with the OTERM and OSBYE utilities.

My Osbreak works great. I only had two problems getting it set up, neither of which was the fault of the Osbreak. First, if you currently use a modem on the serial port, pins 2 and 3 must be reversed at one end or the other of the cable.

The manual has a note on page three about this: "If your equipment is wired as DTE," but it neglects to mention that the Osborne 1 serial port is reversed from the modem port or that the serial port is wired as DTE. Pins 8 and 20 may need to be reversed if your modem uses them. Mine doesn't, and the manual doesn't say anything about them.

My second problem occurred when everything just quit working. I don't know the exact cause but I finally figured out what I was doing to create the problem.

I called up the computer at work, logged-on using OTERM and made sure everything was working. Next, I unplugged the modem from the serial port, plugged it into the Osbreak, changed OTERM to use the modem port and tried to type. Nothing happened. Something at one end or the other doesn't like the cable to be unplugged, although this is the first time I have found that to be a problem.

So when you test your Osbreak, make sure everything works on the serial port, logoff the system you are using, hang up the phone, get out of OTERM and then switch the cable. When you get reconnected, everything should work correctly.

The Osbreak comes with a 15-page owner's manual that explains how to connect the Osbreak in general terms. It also has several pages on the configuration switches with a good description of how each switch works in each setting. It assumes that the reader knows more than a little about RS-232C.

If you know whether your modem is cabled as a DCE (Data Communication Equipment) or as a DTE (Data Terminal Equipment), you should have little trouble. If you have to do any research to answer that question, it may take a little trial-and-error to get the Osbreak working.

The only bad thing I found about the Osbreak was on the "Return For Repair Procedure" page of the owner's manual. Step 1 is "Write Image Sales for a return authorization number." My experience with other companies that make this type of requirement has been bad.

I have no idea why companies do this—perhaps they try to make it as hard as possible or try to look like a big company. Whatever the reason, keep in mind that by the time you send them a letter and they reply, it will add at least a week to the repair time.

If you plan to repair it yourself, you'll have to do so without a theory of operation and schematic, as they're not included in the owner's manual. I don't know if Image Sales will provide them, but the Osbreak looks simple enough to troubleshoot without them.

In summary, the Osbreak looks like a reasonably well-made piece of equipment at a reasonable price. It provides two needed features for the Osborne 1: a break key and a way to use the modem port. The documentation isn't as informative as I would like but it is adequate. I can't comment on their repair service and hope I'll never be able to. Overall, the Osbreak is a good deal.■

Address correspondence to Tim R. Norton, 1107 Southwestern Drive, Richardson, TX 75081.

DIMENSION. THE MOST POWERFUL, MOST COMPATIBLE PERSONAL COMPUTER YOU CAN BUY.

Circle 239 on Reader Service card.

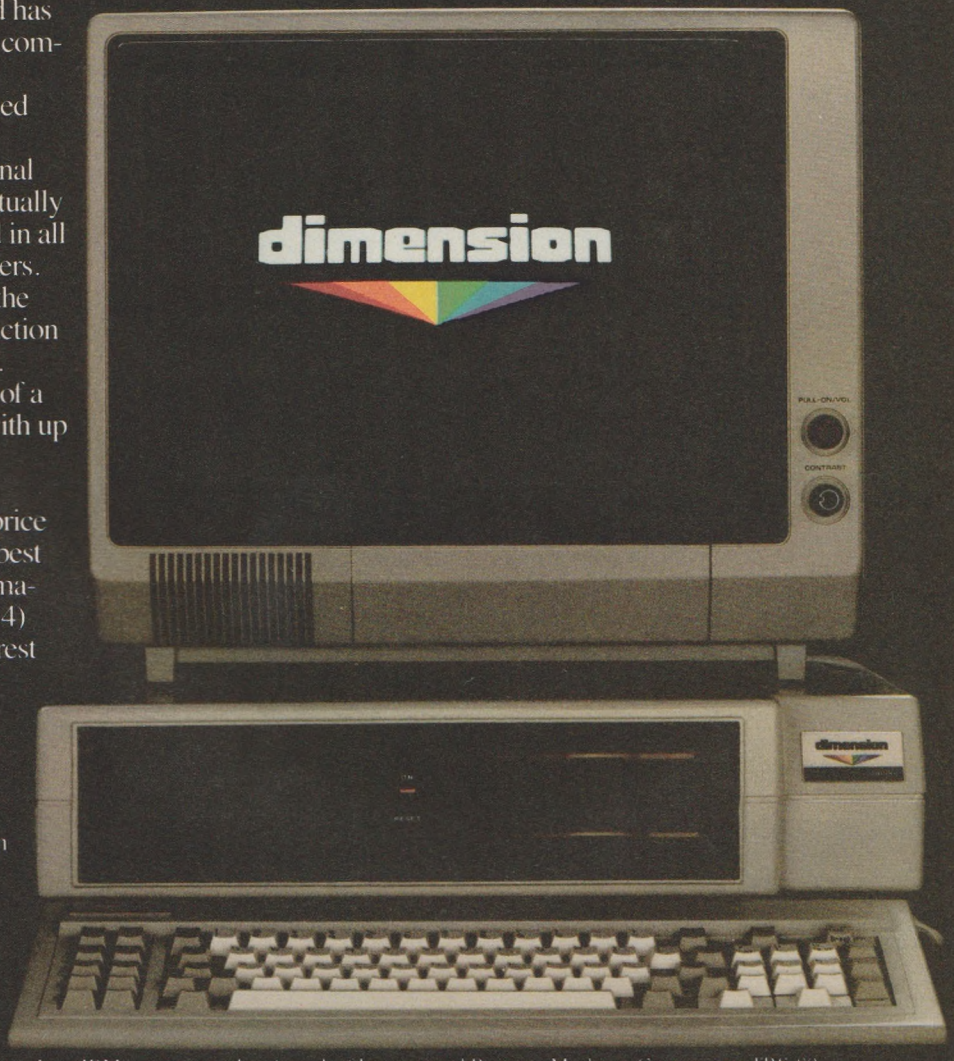
Introducing the capability the world has been waiting for. A single personal computer able to handle Apple,® IBM,® TRS-80,® UNIX™ and CP/M® based software.

The Dimension 68000 Professional Personal Computer does it all. It actually contains the microprocessors found in all of today's popular personal computers. And a dramatic innovation creates the environment that these systems function merely by plugging in the software.

Add to this the incredible power of a 32 bit MC68000 microprocessor with up to 16 megabytes of random access memory.

Dimension. At about the same price as the IBM® PC, it's obviously the best value you can find. For more information ask your dealer or call us at (214) 630-2562 for the name of your nearest dealer.

dimension



A product of Micro Craft Corporation
4747 Irving Blvd., Suite 241
Dallas, Texas 75247. © 1983

Apple is a registered trademark of Apple Computer, Inc.; IBM is a registered trademark of International Business Machines Corporation. TRS-80 is a registered trademark of Radio Shack, a Tandy Corporation company. UNIX is a trademark of Bell Laboratories, Inc.; CP/M is a registered trademark of Digital Research Corporation.

Dimension 68000

By Jim Heid
Microcomputing Technical Editor



The Epitome of Compatibility?

When most companies set out to build a compatible computer, it's usually the IBM Personal Computer they're out to imitate. They give their new machine an 8088 and MS DOS, throw in a couple of 320Kb disk drives, and maybe an IBM-compatible expansion slot or two, and call it a day.

That wasn't enough for Mike Carpenter. In November 1981, he decided to sell his scientific equipment manufacturing company and build a compatible of his own. His computer wouldn't be just another PC clone. He decided that a truly compatible computer should be compatible with all popular systems, have a powerful microprocessor and have a flexible design that would delay obsolescense (that's the most you can hope for in this industry).

New Dimension in Micros

He came up with the Dimension 68000, a hot new contender that's taken the furthest step in bridging the compatibility gap.

As a beta test site, *Microcomputing* has an early-model Dimension 68000 (Dimension, for short) that we put through its paces. This article is an introduction to the machine—what's under its hood and what it can do. Because our preproduction unit differs from the computers Micro Craft is selling, and because it is *Microcomputing*'s policy to review only production models, this article does not contain benchmark test results. We now have a production model in our offices and will report on its performance in future issues.

An Overview

The Dimension is a 68000-based microcomputer that runs under the CP/M-68K operating system, a version of CP/M 2.2 tailored to the 68000 microprocessor. The computer's standard configuration includes two Shugart half-height, double-density, double-sided, 40-track disk drives (each providing 407Kb of formatted storage), 256Kb of memory, one RS-232C serial port, one parallel port and

Address correspondence to Jim Heid, c/o Microcomputing, 80 Pine St., Peterborough, NH 03458.



a six-slot expansion bus. It lists for $3995.

The expansion bus is half of the secret to Dimension's flexibility. The slots accept optional plug-in emulator boards that contain their own microprocessors and support circuitry. Three boards are currently available—an 8086 board, a Z80 board and a 6512 board.

The other half of the secret are the emulation programs, which run under CP/M-68K. Once an emulator board is installed, simply run the accompanying emulation software, and you have, for all practical purposes, an entirely different computer (see the photos that accompany this article).

Software is available that lets Dimension look like an IBM PC, an Apple II, a TRS-80 Model III, an Osborne and a Kaypro. Each emulator board and software combination sells for $495.

It takes an amazing piece of hardware to be able to imitate almost every major computer system available. The key word in Dimension's design is flexibility. You can alter almost every major aspect of the machine's operation under software control. The expansion bus gives you access to nearly every major signal in the machine. In all, it's quite a design feat. Let's look inside.

The Dimension's Brain

The brain behind Dimension's brawn is a Motorola MC68000, running at 8 MHz. The 68000 is considered by many to be the most powerful and easiest-to-program 16-bit microprocessor available. It's able to directly address 16 megabytes of memory, without the complex paging or segmentation demanded by chips like the 8086/8088.

The 68000 contains eight 32-bit data registers, seven 32-bit address registers, two 32-bit stack pointers, a 32-bit program counter and a 16-bit status register. The data registers can handle eight-bit bytes, 16-bit words or 32-bit "long" words, while the address registers can handle either 16-bit word or 32-bit-long word operands.

Although the address and program counter registers contain 32-bits, design and packaging trade-offs limit the chip to using only 24 bits to address memory.

Inside the Dimension

Photo 1 shows the unclad Dimension. The computer's video circuitry, located in the lower left of the photograph, is a perfect example of the machine's flexibility.

One of the myriad of problems that had to be solved during Dimension's design process was how to get the machine to emulate the many different character sizes and display formats currently in use. Micro Craft solved the problem by giving its machine a programmable dot clock.

A dot clock controls the amount of time that the CRT's electron beam is turned on. A longer dot pulse means that the electron beam is on for a longer time period; therefore, the dot it draws is wider, and fewer characters can be displayed across the screen. A shorter clock pulse means that the beam is on for a shorter time period. The dot it draws is narrower, allowing more characters to be displayed.

For example, in its 80-column display mode, Dimension's dot pulse is 70 nanoseconds long; that is, when drawing a dot, the electron beam is turned on for 70 nanoseconds. In the 40-column mode, the dot pulse lengthens to 140 nanoseconds.

It takes an amazing piece of hardware to be able to imitate almost every major computer system available. The key word in Dimension's design is flexibility.

This feature lets the machine display from 20 to 100 characters per line, and from 20 to 50 lines per screen, all from one character generator.

Besides making it easy for the machine to imitate various screen formats, the programmable dot clock has another advantage. By lengthening the dot pulse to about 800 nanoseconds, you can effectively "shut down" the video generator, blanking the screen and thereby increasing the computer's effective speed. This feature is most valuable in heavy number-crunching applications.

You can also change the number of horizontal dots in a character cell. The machine normally displays eight dots across (in an 8×10 matrix) but, under program control, you can tell it to display only seven dots across. This also increases the computer's effective speed.

The Dimension lets you access 64Kb of graphics memory, giving the machine bit-mapped graphics resolution of 160×500 pixels in 16 colors, or 640×500 pixels in black and white. The graphics and text memories are separate, which means that you can mix text and graphics on the same screen.

The computer's standard character set is attractive and easy to read. You can, however, define your own character sets and call them by changing a pointer in low memory. In fact, you can define as many character sets as you have memory for, and switch between them "on the fly" simply by changing the pointer.

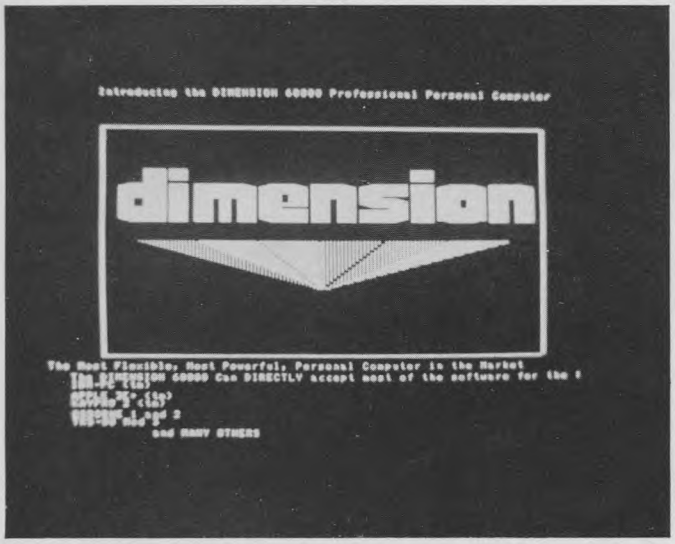
Dimension also supports variable scrolling. By changing another low-memory pointer, you can scroll some lines while retaining the remaining lines. You can also control the scrolling through Unibasic's (Micro Craft's Applesoft-compatible Basic) Mode statement.

The Keyboard

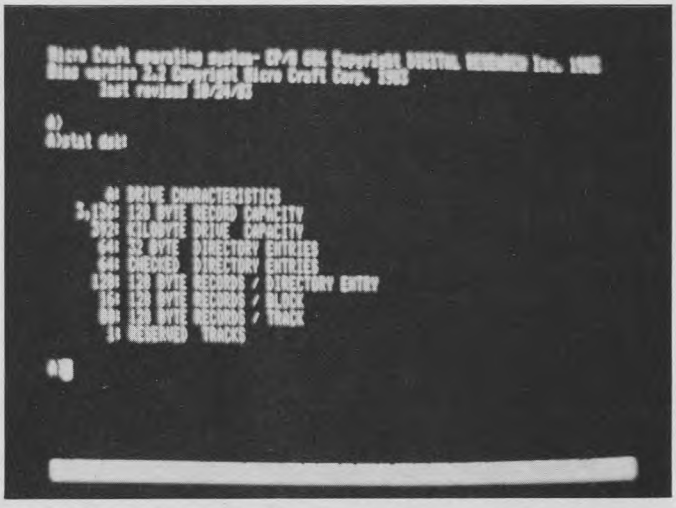
Dimension's keyboard is manufactured by Keytronics. The keyboard layout is much like that of an IBM PC, except that the return key is better positioned, the backslash key (\) is to the left of the left shift key (instead of between the shift key and the Z key) and the caps lock and number lock keys are illuminated when active. These differences aside, the keyboard has the same (rather crowded) layout as the PC's.

The Keytronics keyboard has a different feel than IBM's. It lacks the mechanical "click" that so many have come to love or hate and instead substitutes a kind of springy touch. It's not the smoothest touch in the world, but it's usable. I do wish Micro Craft would have chosen a less-crowded layout, however.

The keyboard circuitry is another example of Dimension's flexibility. Normally, a pointer in low memory points to the default key code set contained in the machine's ROM. By changing that pointer to point to your own key code set, however, you can redefine the keyboard to any layout desired. According to Carpenter, plans are in the works to make the keyboard even more flexible.



An example of Dimension's graphics capabilities.



The Dimension screen in its 80-column by 24-line mode. The white bar at the bottom of the screen shows which disk format each drive is currently assigned.

Fond Memories

If memory is what you want, Dimension is what you want. The machine can house up to 512Kb of memory on its motherboard, and you can fill each of the computer's six expansion slots with another 512Kb. If that isn't enough for you, an expansion chassis will be available "late first quarter, 1984," that will let you add more memory boards, all the way up to the 68000's maximum of 16Mb.

Because, in Carpenter's words, "We didn't want to limit the box," Dimension's ROM is mapped to reside in the last 64Kb of physical memory space, which lets you add RAM all the way up to that point.

Initially, the memory boards will be available only from Micro Craft. The firm is providing full specifications and technical assistance to third-party manufacturers, however, so multifunction cards are a definite possibility.

Construction

The Dimension is a rugged machine. The cream colored, textured case is made of high-pressure Norel structural foam. It's strong enough to stand on, something Carpenter will be sure to tell you. ("Other manufacturers may stand behind their product. We can stand *on* ours.") The case is fully shielded with a layer of conductive nickel paint.

Dimension was designed for a 15-minute repair cycle; that is, a repair person is supposed to be able to remove the cover, locate the problem, replace the bad components and replace the cover in 15 minutes. Third-party service firms that charge by the hour will not like this machine.

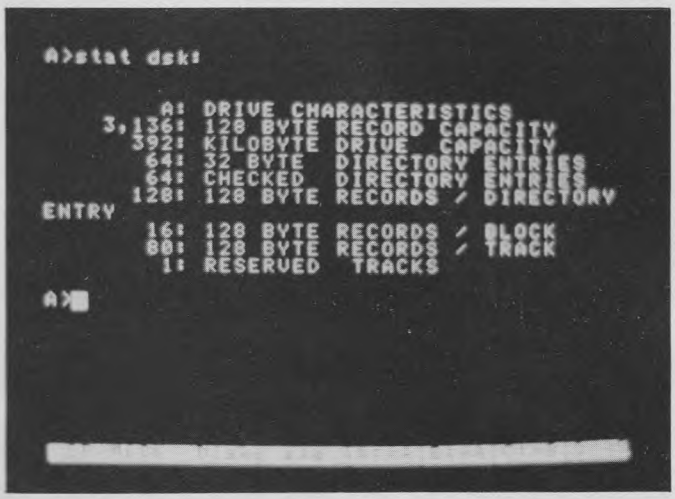
Hobbyists, however, will love it. Micro Craft has a refreshing attitude regarding user modifications: the machine's warranty is not voided if you open the case.

In Carpenter's words, "We do expect the user to get into this box. There will be no warranty-void seals or anything like that. If you build a good box, there's no reason for it."

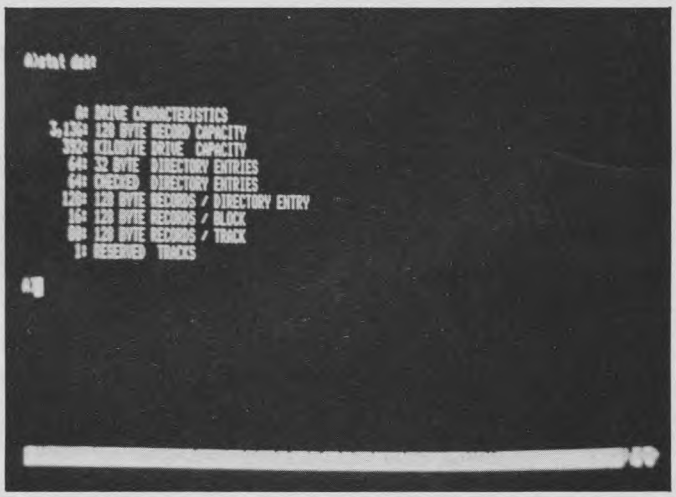
Dimension's power supply is a meaty 100-watt, 15-amp job that offers enough juice to power just about any board you'd want to add. The supply is cooled by a pleasantly quiet fan.

The computer's four-layer motherboard is well-designed, and every chip is socketed, rather than soldered, in place. Micro Craft is showing its confidence in the machine by giving it a one-year warranty.

Because the sides of Dimension's case are flat, the machine can stand on its side, which lets you free up a lot of desk space. This might put the computer's disk drives a little too close to a dirty environment (the floor), although our unit didn't seem to mind. I'd like to see Micro Craft include



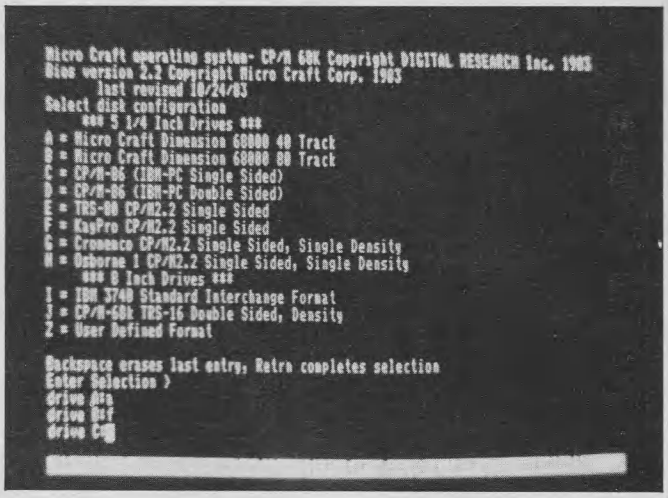
The 40×20 mode. Each different screen format is selected either by running a utility program or by using Unibasic's Mode statement.



The 100×24 mode. The garbage characters at the right of the disk-format line were caused by a small bug in our preproduction unit.



The 80×50 mode. This mode requires a high-quality monitor to be usable.



The Reset utillity's main manu. You can assign any of Dimension's disk drives to any of the formats listed.

some peel-and-stick rubber feet for those who want to use the machine this way.

Dimension's Bus Structure

The Dimension's bus structure is, unfortunately, not standard. According to Carpenter, "No standard bus gave us access to all of the signals we had to have to make [the machine] this flexible."

The bus connectors, 86-pin monsters, give you access to the Dimension's 24-bit address lines, its 16-bit data path and all major 68000 signals, plus memory-access signals and individual interrupt and direct-memory access capabilities for each slot.

All disk drive signals are also available on the bus, which means that you can plug in custom nonstandard disk controllers. An example is Micro Craft's Apple emulator board, which has its own disk controller that supports the "half-tracking" often done to copy-protect Apple software.

As stated earlier, Micro Craft is providing third-party manufacturers with full details of the Dimension's bus structure—its timing, signals and so on.

As part of this push for third-party hardware support, Micro Craft is offering a development kit that includes documentation and what Carpenter calls a "kludge card"—a prototyping board that plugs into an expansion slot and can be wire-wrapped or soldered. A hobbyist version of the card will also be available.

The Disk Controller and Mass Storage Options

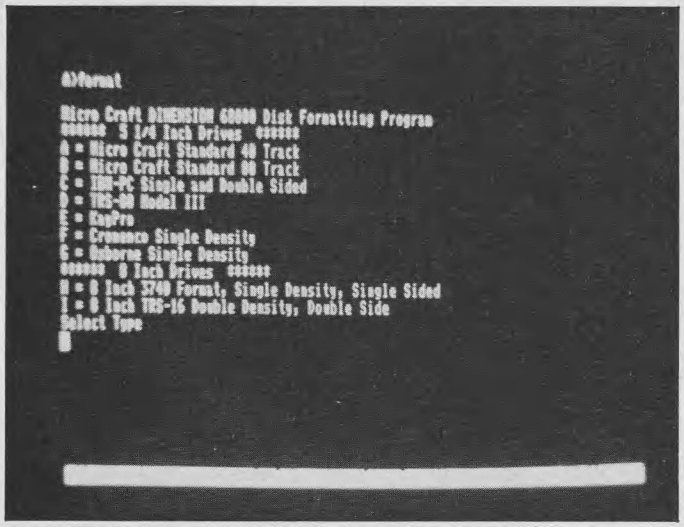
Dimension's flexibility extends to its disk controller. A NEC 765, the controller can handle up to eight drives, single- or double-density, one- or two-sided, in a mix of 3¼-,3½-, 5¼- or eight-inch sizes.

The disk controller can read any standard IBM-format, soft-sectored disk. You can also define your own disk format with one byte to 4Kb per sector, between one and 256 sectors per track and up to 256 tracks.

A hard disk controller should be available by the time you read this. The controller will support two hard disks, and 10 Mb and 50 Mb built-in hard disks will be offered as options.

Supplied Software

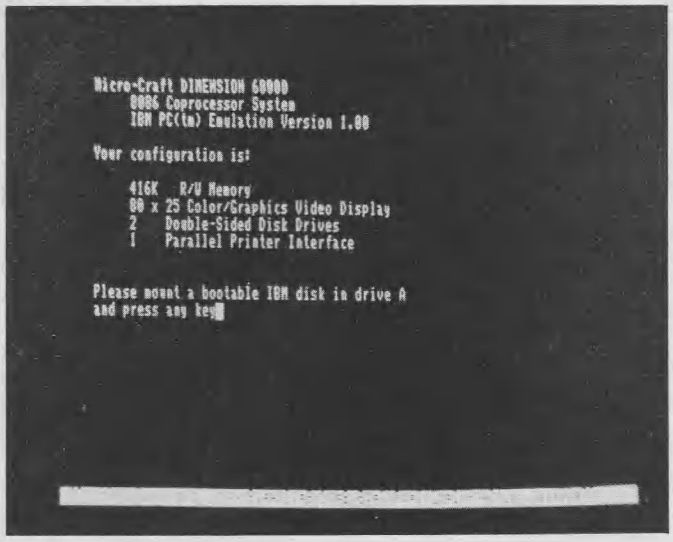
Supplied with CP/M-68K are the standard CP/M utilities, including ED, DDT-68K, PIP and STAT. Also included are a C language compliler, a link-



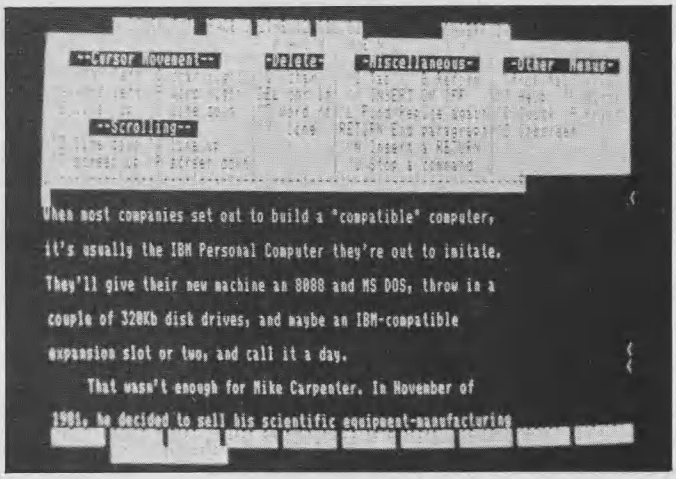
The format utility's menu. Dimension can format disks in any of the formats shown, or you can define your own disk format.



The Apple emulation program's sign-on screen, showing the configuration of your "Apple." This screen appears when you first run the Apple II Plus emulator program.



The IBM emulation program's sign-on screen.



An IBM PC version of WordStar 3.3, running under MS DOS, which is running under CP/M-68K! The small white bar at the bottom of the screen is displaying the message "IBM PC EMULATOR," and is present the entire time the emulator is running.

ing loader and a 68000 assembler.

Micro Craft is supplying several utilities of its own. The Reset program lets you reconfigure the Dimension's disk drives to a variety of formats. The Format utility lets you format and verify disks in a number of different formats and display and print sector dumps.

Other utilities let you change the computer's screen format. You can specify the default 80-character by 24-line format, or choose from 100×25, 80×50, 40×24, or 20×20.

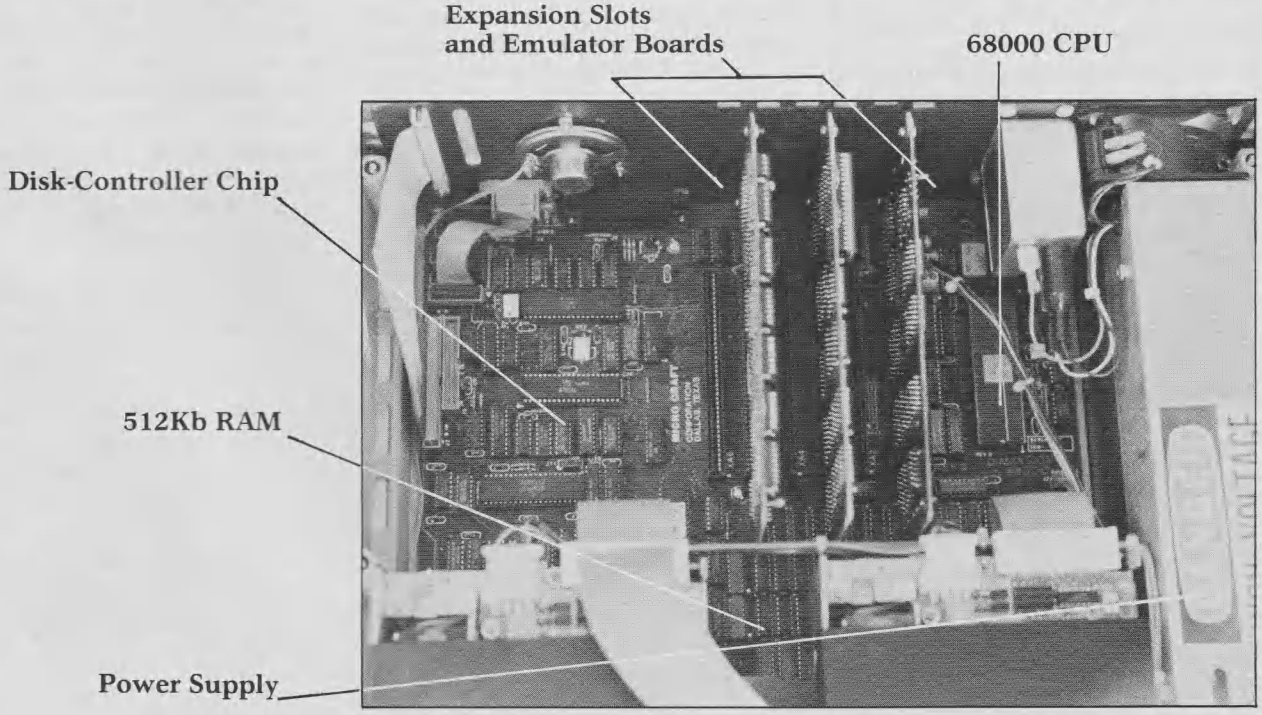
Also included is a utility that lets you configure Dimension's RS-232C port. You can specify any bit rate from 50 to 19.2K bits per second (38.6K bps is possible with some restrictions), in any parity and stop-bit combination.

Other supplied utilities let you create unique CP/M disk formats (in case you have a CP/M-format disk that Dimension doesn't already read) and copy MS DOS format files to any of the CP/M formats supported by Dimension.

Unibasic

Dimension's Basic is called Unibasic. It was developed for Micro Craft by a Dallas-based software house called RD Software. The interpreter was written in C (don't lick your chops; source code is not provided). It supports the full 16 Mb memory capability of the 68000 and boasts 64-bit floating-point precision.

Unibasic is compatible with Applesoft Basic, all the way down to Applesupported printer, video and keyboard-control peeks and pokes. In fact, the language has two sets of peek and poke statements. Peek and poke operate on Applesoft addresses, and



The naked Dimension. The large ribbon cable at the lower middle of the photograph was unplugged to make the circuit board more visible. It normally plugs into the multipin connector next to the controller chip.

APeek and APoke (for *absolute* peek and poke) go directly to the 68000.

Unibasic adds other features that Applesoft lacks, including a VARPTR function, a Call statement that supports up to 15 arguments and a Mode statement that lets you change the screen format and lets you change Dimension's variable scrolling.

Unibasic was written in a "tabular" fashion, meaning that most keywords are located in tables with jump vectors that steer the computer to the code that performs each function. This design lets Micro Craft (or Dimension owners) adapt Unibasic to other dialects by adding new code and changing the necessary jump vectors.

Operating Systems

Besides CP/M-68K, Dimension can run SofTech Microsystem's Pascal system. Micro Craft is also working on making a single-user, multitasking, Unix-like operating system available for Dimension. This system will also have some type of networking capabilities.

Applications Software

There isn't exactly a wealth of software that runs under CP/M-68K. Micro Craft is working with third-party software houses to convert their programs to run under Dimension's native operating system, but, until that happens, you'll have to rely on the computer's emulation talents.

Documentation

Although our copy of Dimension's documentation was in preliminary form, it was still fairly thorough. It included a section on setting up the computer and starting out, an excellent general description of the whole system and sections on the emulator boards.

Here's our verdict: Dimension is a reliable, well-built computer. When it reaches dealers' shelves, it will be the ultimate compatible.

Several appendices were also included. One listed the 68000's instruction set, another showed the Dimension's memory map and others contained a full description of 29 ROM basic input/output system calls, a list of the expansion bus pins and their functions, and a glossary.

The *Unibasic User's Guide* is a general overview of the language and includes sections on converting programs written in other Basic dialects, a section of file-handling and a useful section on calling assembly language subroutines from Basic programs.

The *Unibasic Reference Manual* is a conventional Basic reference manual that lists the syntax of each statement and explains its use. The reference manual is clear, but not written for the beginner.

Although preliminary, Dimension's documentation was clearly written and easy to follow. Many instructions were sprinkled with tutorial information that explained why you were doing something, instead of just telling you what keys to press. The final product should be excellent. (We'll let you know.)

I do hope that Micro Craft has the manuals professionally designed and typeset, however. Daisy-wheel printers are great for letters and manuscripts, but not for a finished product. Typeset manuals are more legible, and that translates into better comprehension.

Who Will Buy Dimension?

Micro Craft is aiming its machine at three markets. The first is what Mike Carpenter calls "second-generation users." These people have TRS-80s, Apples or eight-bit, CP/M-based machines. They want something more powerful, but they have a lot of time and money invested in software and don't want to lose that investment.

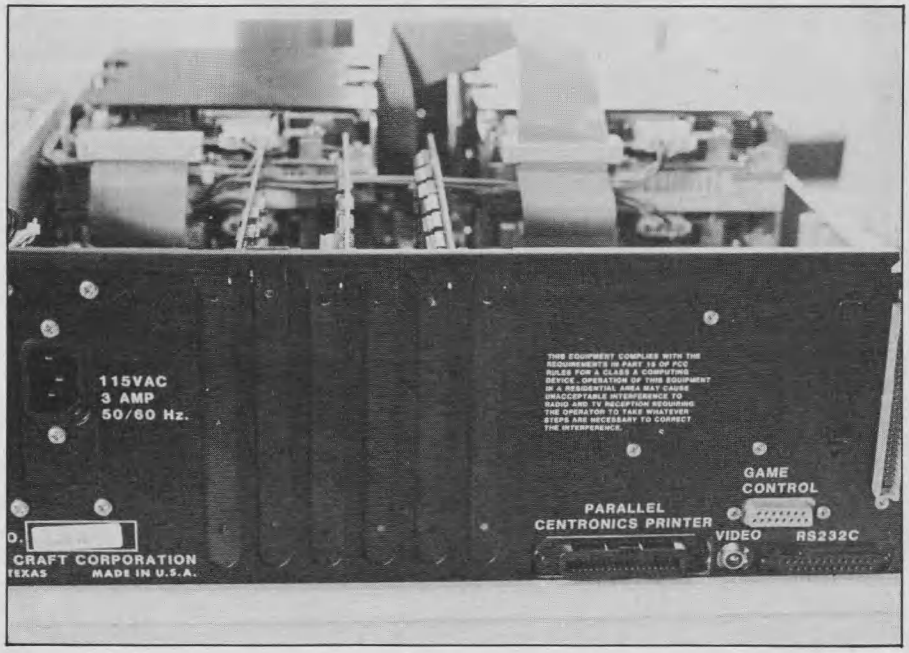
Second-generation users are also a little wary of what to buy next. They've seen their eight-bit equipment depreciate faster than a Ford Pinto and they want to make sure that their next machine has the power and flexibility to last a little longer.

The second major market for Dimension is the scientific community, a market that hasn't been addressed adequately. Carpenter came from the scientific equipment manufacturing world and has incorporated much of his experience into Dimension.

Dimension's third market is what Carpenter calls the "sophisticated first-time buyer." This person doesn't own a computer, but has learned something about them through school or friends or by reading. This person knows enough about computers to know that he or she needs a machine with a wide software base and with the flexibility to grow with the technology.

Wrapping It Up

Dimension's emulation talents are amazing. The three emulator boards now available—8086, 6512 and



Dimension's rear panel and extranal connectors.

Z80—will let the machine run software written for the IBM PC and its many clones, the Texas Instruments Professional Computer, Kaypros, Osbornes, Apples and TRS-80 Model IIIs.

Our preproduction Dimension performed flawlessly from the hardware standpoint. It never rebooted unless we wanted it to and the disk drives performed perfectly, even with those generic disks that come packaged in zip-top bags. The keyboard worked as it was supposed to and the computer's quiet cooling fan kept everything at healthy temperatures.

We did have some troubles in the emulation department, however. We used the unit most in its IBM PC emulation mode, and some programs (WordStar, 1-2-3, MultiMate, dBaseII) ran perfectly, while others (VisiCalc IV, Knoware) didn't.

In all fairness, however, many, if not all, of our problems stemmed from the fact that our machine was not a fully debugged production model. Dimension's design and testing process has been a monumental task, and Micro Craft is working hard to add more programs to the computer's compatibility stable. We'll report more on its performance in future issues.

So, until we thoroughly test and report on our production model, here's our verdict: Dimension is a reliable, well-built computer. When it reaches dealers' shelves, it will be the ultimate compatible. It offers a powerful microprocessor and incredible versatility. It should be a perfect "second-generation" machine for Apple, TRS-80, and eight-bit CP/M machine owners, and deserves consideration by anyone thinking about an IBM PC.

If you have specific programs you want to run on the machine, take them to a Dimension dealer and try them. That's the best way to ensure compatibility with your application.■

A Capsule Look At the Dimension 68000

Manufacturer
Micro Craft Corporation, Dallas, TX

List Price
$3995

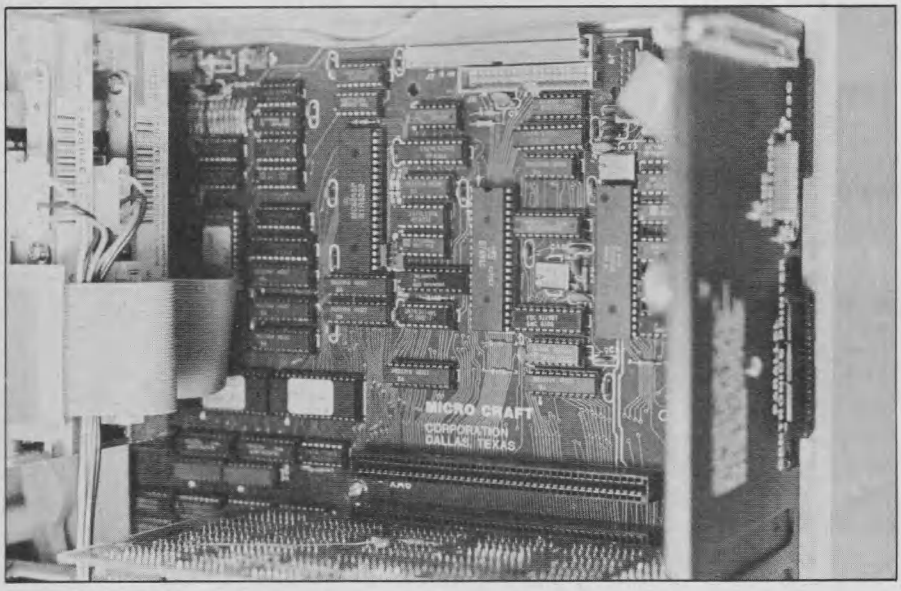
Standard Features
Motorola 68000 CPU, running at 8 MHz; 128Kb memory, two 5¼-inch disk drives; RS-232C serial port; parallel port; graphics controller; real-time clock; Keytronics keyboard; six-slot expansion bus.

Proportions
Twenty-seven pounds, 17×3/8×6

Included Software
CP/M-68K, C language compiler, linking loader and 68000 assembler; Unibasic (Applesoft-compatible); numerous utilities to change disk and screen formats and to configure RS-232C port.

Options and Accessories
Emulator boards and software ($495 each); 10Mb or 50Mb hard disk drives; expansion chassis; memory expansion.

Documentation
None available at time of review.



A close-up of Dimension's disk-controller circuitry. Note the generous use of IC sockets (every chip has one). Two expansion slots, one containing the 6512 emulator board, can be seen at the bottom of the photograph.

Circle 78 on Reader Service card.

EXPOTEK
2723 W. Windrose • Suite 3
Phoenix, Arizona 85029
1-800-528-8960

GUARANTEED LOW PRICES

IBM
CALL SAVE $

ATS — Persyst
Big Blue — Profitsystem
Hercules — Quadram
Microsoft — StB
Maynard — Talltree

DISK DRIVES
Tandon 100-2
Davong 5,10,15mg
Carona 5,10,15mg

MONITORS
Taxon
PGS
USI

ALTOS
5-15D — $2120 — 586-14 — $7680
580-10 — $4199 — 586-10 — $5498
580-14 — $9395 — 8600-12 — $8399

CITOH
F10 40cps — $1090 — F10 55cps — $1499
1550P — $599 — 1550CD — $655
8510P — $375 — 8510BCD — $499

DATASOUTH
DS120 — $595 — DS180 — $1155

DIABLO
630RO — $1710 — 620 — $875

HAZELTINE
1500 — $995 — ESPRIT I — $498

MICRO SCI A2
$245 — Apple Drive/Card — $330

MODEMS
HAYES — MICROMODEM — $263
HAYES — SMARTMODEM — $199
HAYES — 1200 Baud — $485

MONITORS
Amdek 300G — $129 — Color I — $275
Amdek Color II — $425 — Amber — $145
BMC Green — $88 — USI Amber — $149

NORTHSTAR
Advantage — $2150 — 280A — $1950
5m Byte — $3350 — 15m Byte — $4310

NEC
8023 — $399 — 7710 — $1900
3510 — $1365 — 3550 — $1705

OKIDATA
M92A — $ CALL — M93A — $ CALL
M82A — $ CALL w/Tractor & Grap. $ CALL
M84P — $ CALL — M84S — $ CALL
Pacemark 2350P — $ CALL

TELEVIDEO
802 — $2515 — 802H — $4449
806 — $4950 — 800A — $1250
803 — $1845 — 1603 — $2199

TELEVIDEO
910 — $555 — 925 — $699
970 — $1015 — 950 — $865

SOFTWARE
All Major Brands Discounted — $ CALL

DISKETTES/BOXES
Elephant - $15.50 Scotch - $22 Dysan - $33
($100 Min.)

All Prices Subject To Change

Customer Service
602-863-0759

Circle 285 on Reader Service card.

Hello, information.

Or, how the IBM Personal Computer can bring you the world.



Modem shown not supplied by IBM.

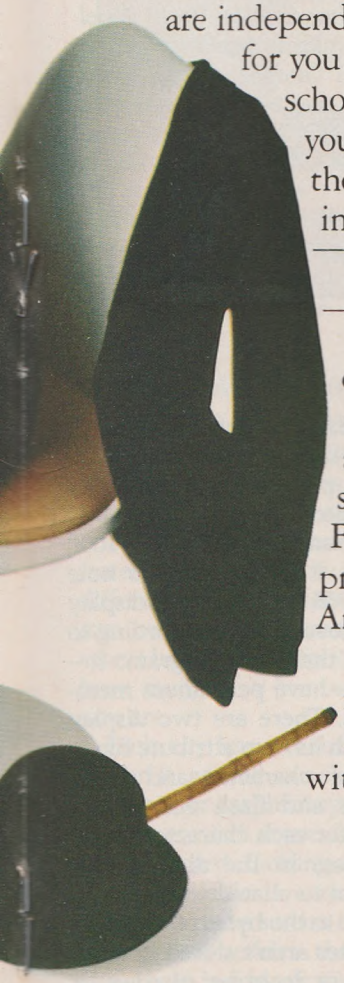
There's a world of information just waiting for you. But to use it, study it, enjoy it and profit from it, you first have to get at it.

Yet the facts can literally be right at your fingertips—with your own telephone, a modem and the IBM Personal Computer.

Plug into the network.

The modem that plugs into your phone takes the codes your IBM Personal Computer understands and turns them into signals that can be transmitted over the phone lines.

On the other end of the phone lines are independent information services* ready for you to access from your home, school, lab or office. So, in minutes, you can tap the resources of over a thousand data bases—and plug into a world of possibilities.



Something for everyone.

At home, for example, you can shop through an electronic catalog. Access mortgage amortization and tax depreciation schedules. Study the wines of France, the foods of Italy. Find property to sell, rent, swap or share. And play hundreds of games.

At school, you can bring news into the classroom—as it happens. You can teach and learn with facts about everything from phrase origins to plane geometry. You can also tap instructional courses and learn how to program the very IBM Personal Computer you're using.

In the lab, you can call up a wealth of mathematical and statistical programs or retrieve scientific and technological data.

In the office, you can plug into the commodities market. Read abstracts of leading publications. Even get census figures to see who's in your major market. And when you're planning a business trip, your IBM Personal Computer can provide airline schedules and car rental information, as well as tell you what the weather is and where the best restaurants are.

Calling all computers.

And these outside data bases aren't your only information link, either.

With assigned passwords, you can also have access to data that's stored in your company's IBM minicomputer or mainframe via your IBM Personal Computer.

You can even exchange a sales forecast with a manager two floors down or two thousand miles away—one IBM Personal Computer to another.

So the IBM Personal Computer really *can* let you call the world. But there's one call to make first. For more information on where to buy the IBM Personal Computer, call 800-447-4700. In Alaska or Hawaii, 800-447-0890. IBM®

The IBM Personal Computer
A tool for modern times

*Information services are available by subscription at additional cost, and are not supplied by IBM.

Timex/Sinclair's "Timely" Upgrade



By Sharon Zardetto Aker

Projected and actual release dates for new computers seldom coincide, and the Timex/Sinclair color computer fell prey to that "arrival gap."

The seven-month delay, however, was worth the wait: the T/S 2068 far exceeds the specifications of the originally announced model.

The 2068 is more than just an Americanized Spectrum, Clive Sinclair's upgrade of his popular ZX-81 computer. Based on some heavy market research and lots of user input, Timex has come up with an exceptional computer for only $199.95.

The Outside

The 2068 is a sleek, silver unit; the top right-hand portion of the computer casing flips up for inserting cartridges. The joystick ports are placed on each side; the peripheral (for now, the printer) port is at the back, as are jacks for power, TV and monitor connections and ear/mic plugs for the tape recorder.

The 42 full-travel keys are surprisingly comfortable to work with: they are well-spaced and provide both audio and tactile feedback. In addition to changing from the T/S 1000's much-maligned membrane-style keyboard, the 2068 has the added improvements of two shift keys in the expected positions, a full space bar and a separate break key. The legends for each key are clear, which is quite an accomplishment because each key serves six different functions. Also worthy of note, because of its absence in the 1000, is the 2068's power on/off switch.

The Inside

The 2068, with its Z80A CPU, runs at 3.5 MHz. Like the Spectrum, the Timex is designed for savings, not speed: out of its 48Kb, 38652 bytes are available for Basic programming. (By comparison, 38911 are available from Commodore's 64Kb.)

There is 24Kb of ROM. Although the RAM is not immediately expandable (there are no memory modules available) or even planned, the 2068 does have bank-switching capabilities.

For those familiar with T/S 1000 programming, it's interesting to note that in the 2068 memory, the display file doesn't move around according to the length of the Basic program; it—actually, *they*—have permanent memory addresses. There are two display files, each with its own attribute file to keep track of character and background colors and flash and brightness controls for each character space.

The addresses in the display files correspond not to character spaces on the screen but to the bytes of the characters; the bytes aren't stored in character groups, or in order of rows or columns, but according to the scan lines on the screen. This makes dis-

Address correspondence to Sharon Zardetto Aker, 20 Courtland Drive, Sussex, NJ 07461.

play file peeking and poking impossible, or, at the very least, impractical.

The Displays

The normal display mode, only one of four possible, is 32 × 24, with the bottom two lines reserved for input information. Characters are crisp and clear on a monitor; they are a little thicker, but still clear, on the TV screen. While commands appear in uppercase letters, the keyboard immediately defaults to lowercase; the character design is noncomputerish and easy to read.

A 64-column mode can be achieved with machine code; that is significant, since that makes 80 columns with two eight-character margins—does the phrase "word processing" ring a bell? This mode uses the two display files at one time, with one handling the odd-numbered columns and the other the even-numbered columns.

Both display files are also utilized in the alternate display mode, which lends itself to animation because it flashes first one display and then the other on the screen. The fourth display mode allows you to assign attributes to individual pixels, instead of to character spaces; this is referred to as the enhanced mode.

Normal resolution is 256 × 192; in the enhanced and 64-column modes, the horizontal resolution increases to 512, very impressive for a low-end computer.

Working With the 2068

The 2068 is advertised as having one-key commands. Because double-shifting is sometimes required, as many as three keys must be pressed to enter some commands. This is still faster than having to type in three different letters, since the shift keys are conveniently located, and you won't have to hunt for them no matter how much of a hunt-and-peck typist you are.

Each key has a main letter or number on it, as well as a shifted symbol, a keyword or graphics symbol and commands printed above and below it on the keyboard. Getting at the different items available is a matter of which cursor is on the screen and which shift you press—besides the regular shift key, there is a black symbol shift key. In order to minimize confusion, the symbols accessed by the symbol shift are in a black bar on each key.

Cursors change automatically, as well as in response to shifting. Inverse K, L, C, G and E are the possible cursors for keywords, letters, capitals, graphics and extended commands. I was prepared to find the double-shift system unwieldy and not worth the one-key command entry; actually, it is easy to get used to and comfortable to use.

Editing was never a comfortable operation on the 1000; although it is improved by the repeat-key capability on the 2000, it is still awkward.

It is particularly annoying that the delete function is a shifted key. Editing a program line can only be done with left and right cursor controls; if you have to move back to the beginning of a four-line program entry, you have to do it one character at a time.

On Sinclair computers, each program line is typed in at the bottom of the screen; when it is entered (and approved by the syntax editor) it jumps to the main portion of the screen. To edit an already-entered line, the vertical cursor controls are used to place the program cursor at the desired line, which is brought back to the bottom of the screen by the Edit command. The cursor controls are also shifted functions.

While line editing is not convenient, there are some extras that make it easier. A built-in delete function will remove specified lines from a program; pressing enter will automatically list a program; List will list from the beginning or from a specified line. When the program is longer than a screen page, the listing stops, and you're asked if you want it scrolled; if so, the next page is shown. I find this preferable to listings that automatically scroll, usually past the line you're searching for.

The Character Set

Besides the usual alphanumerics and expected punctuation, the character set includes square brackets and braces, a backslash and the @ and copyright symbols. If you own a T/S 1000, you'll be happy to find an apostrophe and an exclamation point on the 2068, both sorely missed on the 1000.

The graphics characters available from the keyboard are eight (16 with their inverses) boxes with various quarters darkened. There are 22 spaces reserved for user-defined graphics, although the entire character set can be redefined if more space is needed.

Sinclair Basic

Sinclair Basic is a joy to work with and easy to learn. It is exceptionally well-suited for beginners and sophisticated enough for a more experienced programmer.

Since all keywords are automatically spaced, a listing is easy to read; another feature that makes for easy-to-read listings is that parentheses aren't needed as often as in some other Basics.

The Commands' Performance

While Sinclair Basic has some uncommon—even unique—commands, they're all easy to understand and to work with. Here is a simple list of Sinclair Basic commands:

Color: The color commands for character, background and border are Ink, Paper and Border. The Bright command changes the shade; Flash makes the character automatically switch ink and paper color back and forth until the flash is turned off. Inverse will permanently switch the paper and ink colors for that character.

String Handling: String slicing techniques are nonstandard, but easier to work with than the usual. Compare Sinclair's A$(3 TO 5) with the more common MID$(A$,3,5).

Formatting: The inclusion of a Print At command makes formatting screen output simple; it specifies the line and column at which the print position should be, just as the Locate command does in some other Basic languages. Commas move the print position a half-screen, while the apostrophe acts as a linefeed.

Graphics: The Plot command darkens pixels according to the x,y coordinates stated. Unlike the 1000, there is no Unplot available; that function is achieved by plotting over the same section in paper color.

The Circle command uses center coordinates and a radius size. The Draw command has a rather odd argument: two numbers that signify the number of pixels up and to the right that should be darkened, figured from the last plotted or drawn point. To go down or to the left, negative numbers are used. A third number can be added to the Draw command in order to draw arcs, the third number describing (in radians) the angle covered by the arc.

Printer: Commands to send information to the printer are the straightforward Lprint and Llist; there is also a Copy command for a screen dump.

Other commands that should be noted because they were not available

on the 1000 are Read, Data and Restore, Def Fn and Fn, On Err and Bin(ary).

Some commands are unique to the 2000, such as Screen$. Since the display file cannot be peeked, Screen$ is used to check any character space on the screen; it returns the string appearing there. Other screen-reading commands include Attr and Point. The first will return, in code, the attributes (paper and ink color, flash and bright on/off) of any character space; the latter checks to see if a specified pixel is on or off.

Perhaps the most unusual of all the commands is Over. When Over is in effect, you can print one character over another without the first disappearing. The immediately apparent application is with the underline character, but with programmable characters and a little imagination, you can *umlaut* your German and *accent grave* your French, just for starters.

There is a full set of mathematical and trigonometric functions; numbers are stored to nine or ten places. Array, string and For-Next control variable names are limited to a single letter, but numeric variables can be of unlimited length. String array storage is procrustean.

Color and Sound

Although the 2068 is advertised as having eight colors, that is a modest claim. The Bright command makes such a difference that the computer has, for all intents and purposes, 16 colors: red and pink, white and light grey, black and dark grey, and so on. It takes quite a bit of fiddling with color and contrast controls on a TV or monitor to get the true colors, and when all the others are set, the yellow is still more of a pleasant peach than a primary. With colors at normal brightness, just about every paper/ink combination is easy to read. A light ink on light paper is, of course, a strain on the eye, but there is no smearing of the character against the background.

The easiest access to sound on the T/S is with the Beep command, used with one number (.002–10) to signify its duration in seconds, and a second number (–60–69) for pitch. A zero pitch is middle C, and every number above or below represents the number of semitones beyond middle C.

The Sound command is used with pairs of numbers that represent registers and contents. Thirteen registers are used for tuning each of the three channels, setting channel volumes, enabling noise and/or tone on each channel, setting noise pitch and controlling the ADSR envelope. The Beep command can be used at the same time as Sound, so, in effect, four channel sound is available.

The overall range with the sound command is ten octaves. While the range of sound is nice, the quality is not exceptional. The sound comes from an internal speaker, not through the TV or monitor, and all but the mid-range pitches have a thin, almost tinny quality to them.

Savings Plans

The 2068 isn't as picky about its tape recorder as the 1000 is; Timex is not packing a list of compatible recorders as it finally did with its 1000. The transfer rate is 1200 bits per second—a reasonable speed, not as fast as some of the tape systems available, but an improvement over the 1000.

There are various methods of saving programs. Aside from the normal mode, there are also: Save Line, which runs the program automatically on loading, Save Screen$, which saves the screen display, and Save Code, which saves a machine code routine starting at a specified address. Any Load except the Screen$ can be checked with the Verify command.

A special loading option is the merge command which can combine a taped program with the resident program; if any line numbers coincide, the new ones take precedence.

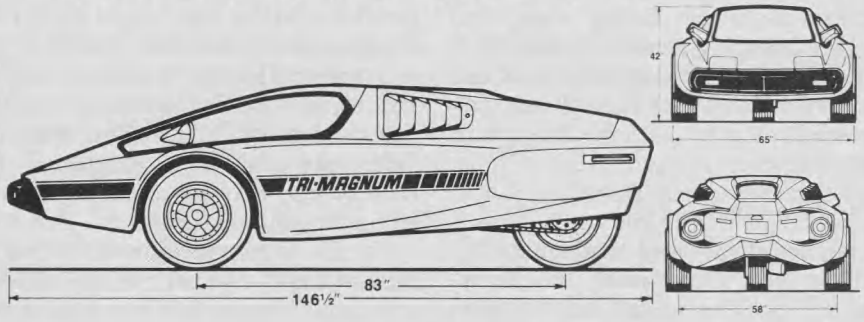
During saving and loading procedure, the border of the screen displays a flickering lined pattern, and the computer notes on screen the name of each program that it passes while looking for the one you want loaded—use a dummy program name and you've got a tape directory.

Author, Author!

Most authors of computer manuals remain in protected (and deserved) anonymity. However, the 2068 manual is a gem; it explains things clearly and in logical sequence. While it doesn't cover some of the more intriguing capabilities of the 2068's, such as alternate display file animation techniques, those techniques are pretty sophisticated and don't demand inclusion in what is meant to be a beginner's manual. Author Charles Durang deserves recognition and con-

Circle 115 on Reader Service card.

HOME-BUILT EXCITEMENT



Build your own high performance sports car. MI's Tri-Magnum uses the 81-horsepower '76 Kawasaki KZ900 motorcycle. Goes from 0 to 100 mph in just over 20 seconds! An exciting new three wheeler with sleek new styling. Simple step-by-step instructions.

For a complete kit with plans and specs send $18.50 plus applicable sales tax (in check or money order) to MI Plans Service, 120 Brighton Rd., P.O. Box 5076, Clifton, NJ 07015.

Mail to: MI Plans Service, 120 Brighton Rd., P.O. Box 5076, Clifton, NJ 07015

Please send me_____sets of the Tri-Magnum Plans. I have enclosed $18.50 plus applicable sales tax for each set.

Name_____

Address_____

City_____

State_____ Zip_____

Full refund within 30 days if not completely satisfied. Allow 4-6 weeks for delivery.

MS4B3S

Circle 179 on Reader Service card.

In The Beginning...



There was the "Shoe-Box" accounting system...

But Now There's Mini-Ledger

While those dinosaur-size companies resort to large, integrated computer accounting packages, your modest-size company can track key income and expense activities through the use of Paradigm's **single-entry Mini-Ledger** program. And you can do this for only $150.00.

With **Mini-Ledger,** you can define up to 99 codes like your company car expenses, entertainment, rent, payroll, cash flow...it's up to you. And because **Mini-Ledger** is so easy to use, you don't need any accounting experience to run it. Also, several printouts are available to help you prepare clear and accurate statements of your financial operation. That's ideal for tax purposes.

To employ **Mini-Ledger,** you need either CP/M, CP/M-86 or MS-DOS, at least one disk drive, and a 132 column printer. A demo version with user's-manual is available for $30.00.

With Mini-Ledger, those prehistoric days of Shoe-Box accounting are over.

PARADIGM CONSULTANTS

MINI-LEDGER

39243 Liberty Street, Suite L • Fremont, CA 94538 • (415) 796-0543

CP/M is a registered trademark of Digital Research Corporation

gratulations. I hope Timex commissions him to do the Advanced Manual mentioned in the text.

Planned Peripherals

As of this writing, the only peripheral available is the 32-column printer, which has received favorable reviews.

There are many peripherals in the planning and development stages. If the Timex timetable is correct, both the $120 modem and an 80-column printer should be available this spring. Timex is also putting out its own tape recorder for $49.95.

The most needed peripheral, of course, is an alternative to tape storage. In early November, a Timex spokesman said that a decision had not yet been made whether to go with a microfloppy or a wafer drive.

Software, Anyone?

Timex has, of course, its own line of software for the 2068, both in cassette and cartridge form. I was provided with a few cassettes, and I have to admit I was impressed with them, especially with the quality of the graphics.

The two games I tried were easily on par with many third-party programs made for other computers; of the two educational cassettes, one was a simple, but nicely done States and Capitals game, while the other was a thorough, well-designed grammar tutor.

As for third-party support, there isn't much (if any) right now, and whether there will be in the future remains to be seen. Softsync, Inc., a company that began as a TI specialists, is releasing 2068 versions of its programs designed for other computers. Most other publishers are more cautious than optimistic, so it will probably be at least a year (if at all) before third-party programs proliferate. It was the same story with the Commodore-64; I hope the Timex story will have as happy an ending.

For the Future

There are commands available on the T/S that you can't use yet: Open#, Print#, Cat(alogue)...all drive-oriented commands, as you may have noticed. When the 1000 came out, there were printer commands that couldn't be used because the printer wasn't available; the Timex plans ahead. When they finally put something on the market, it is good; unfortunately, the delay cause by perfecting the product can kill sales. The drive, whichever one they decide on, should be finished and rushed to the market. (Of course, I would also like to see the Timex version of Sinclair's thin-screen monitor; however there are no plans for that at Timex, at least not that they're admitting. Somebody there must be thinking about it, and it would be nice to see Timex forge ahead with something new instead of always playing catchup.)

For Now

The Timex 2068 has promise, it has potential...but will it have buyers? Well, I already bought one. If you're looking for immediate applications, you might be disappointed with the software support for this computer. But, if you want to design your own programs, ones that won't need vast amounts of data handled and saved, this is a good system; if you, or your kids, want to learn to program, this is a great system. And, if Timex does some aggressive marketing, you may find an explosion of third-party support available by next year.■

Circle 244 on Reader Service card.



Hello, Noah here. Recently I got a contract to build this fellow a large boat. It seems he wants to collect two of each animal and make a floating zoo of some sort. So, in order to keep track of all the building materials and converting everything to cubits like he said, I got a minicomputer. But, with all this rain we have had lately, the power to my computer has been terrible. Every day for the last 39 days I have lost data every time the light blinked. So I got a **MAYDAY** Uninterruptible Power Supply from SUN RESEARCH up there in New Hampshire. Takes all the surges and spikes out of the line and keeps me running during those blackouts. So now I can keep track of all the animals and how many of each I have (those rabbits will drive you foolish) and keep track of all the different supplies (those elephants will eat you out of house and home). I have also hooked my phone system into the **MAYDAY** so I can keep track of incoming calls during those blackouts. The Boss gets really angry when He can't get through...more lightning. I was building this boat in my cellar, but the wife got tired of moving it around and said, "Get that ark out of here." "Ark". I kind of like that name.

So get a **MAYDAY**...for Heavens sake!

SUN RESEARCH, INC.
Box 210
New Durham, NH 03855
603/859-7110
TWX 5102974444

"There's No Time Wiser Than After Dark."

BEAT THE APRIL FEE INCREASE! BE WISE. SIGN UP NOW AND SAVE!

Circle 8 on Reader Service card.



When you're looking for solid, up-to-the-minute information, the best place to search is BRS/AFTER DARK. The one system designed for serious searchers, AFTER DARK offers you more databases citing more authorities on more subjects than any other popular online information service—at the lowest cost.

For only $6 to $20 per connect hour, including telecommunications charges, you can personally access the same online files used by major reference libraries and corporations worldwide. These files contain the latest information on subjects ranging from business management, mathematics and education to health, psychology, chemistry, family planning, and just about everything in between.

The range of databases available keeps expanding all the time. AFTER DARK now brings you the full text of the **Academic American Encyclopedia,** as well as the **Harvard Business Review.**

And for microcomputer buffs, there's a new online Software Directory listing major software packages.

AFTER DARK's simple, interactive language and straightforward logic take only minutes to master. The system is outstandingly comprehensive, remarkably fast, and above all, fun to use. All you need is your classified BRS password and any dial-up system. Then, every weekday from six in the evening until the early morning hours—round the clock on weekends and holidays—you can summon up a wealth of valuable information.

Use the coupon to sign up for BRS/AFTER DARK before another evening goes by. Seriously, it's like having your own university library online at home.

BRS COLLEAGUE **AFTER DARK**

EXPANDED SERVICES: MORE DATABASES, ELECTRONIC MAIL AND SHOP AT HOME. ONE-TIME SUBSCRIPTION FEE ONLY $50 ($75 AFTER APRIL 15, 1984).

( ) Sign me up for BRS/AFTER DARK now! I understand I will be charged a subscription fee of $50 plus connect hour rates as low as $6 per hour, billed to my credit card account with a monthly minimum charge of $12. (My order must be postmarked before midnight 4/15/84.)

( ) Send more information on BRS/AFTER DARK.

Mail to BRS • 1200 RT. 7 • LATHAM, NY 12110 • (518) 783-1161

Name _____

Address _____

City _____ State _____ Zip _____

Charge to MASTERCARD/VISA/AMERICAN EXPRESS
(Circle one)

MI 2/84

Acct. No. _____

Expires _____

Signature _____

What Do You Mean "Compatible"?

Compatibility is a hot issue in the micro field, but just what does the term mean? In this article, author Richard Cook takes you through a crash course in "compatibility."

By Rick Cook



One of the first things you learn as a computer user is that while you can compare Apples and TRS-80s, you can't run TRS-80 programs on an Apple or vice versa.

The exception to this rule is a class of machines called "workalikes," "lookalikes," "clones" or, less elegantly, "knock-offs." They advertise that they're compatible with better-known machines and promise to run the software and use hardware made for those other computers. Generally, they offer additional features and, almost invariably, a lower price.

Right now the leader for the computer most-often-cloned title goes to the IBM PC. At last count, there were about 25 machines either announced or on the market that claim some degree of compatibility with the PC. Other manufacturers advertise compatibility with other popular machines. Franklin says its Ace is compatible with the Apple II, and LNW advertises a machine that it says is compatible with the TRS-80.

Address correspondence to Rick Cook, 213 W. Hayward, Phoenix, AZ 85021.

Just How Compatible Is It?

Fine. But how "compatible" is compatible? Or to put it another way, how certain can you be that the "compatible" computer you're looking at can run the software and hardware of the machine it's modeled after?

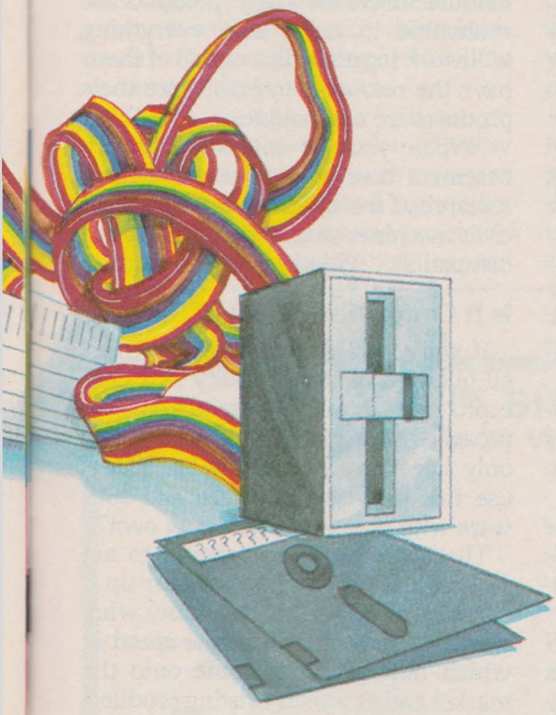
The answer is: it depends. It depends on who's doing the talking and the kind of product being talked about. A prospective purchaser of a lookalike computer, or the owner of a lookalike who's considering buying a piece of software, can't automatically assume that everything will work together. It takes some checking to make sure.

Compatibility In Computers

"The overall issue of compatibility is a muddy one, because it varies from manufacturer to manufacturer," says Tom Hayes, former product manager for the Osborne Computer Company.

Ken Price, director of marketing communications for Compaq Computers, puts the matter even more bluntly. "You can't be 100 percent IBM-compatible unless you're IBM."

Richard Comber, a technical support specialist with Franklin, observes: "When we say we're Apple-compatible, we mean that the vast majority of software and peripheral hardware designed for the Apple will work on our machine."



But everyone agrees there will always be hardware and software that won't work. The fact is that almost no computer is totally compatible with another. That is, no two models are completely interchangeable in terms of peripherals and software. This is often true even when the computers are made by the same company.

Most manufacturers try to make their new models compatible with their existing line, if for no other reason than to provide the new machine with a nice, hefty software base. In practice, that goal slips under the demands of adding new features and modern designs. Since it is to the manufacturers' advantage for the machines to be compatible, they tend to stress the similarities and minimize the differences.

For example, when Radio Shack introduced the TRS-80 Model III, the company claimed that it was software-compatible with the Model I. As long as you were working in Basic or another high-level language, this was true. But there were significant differences in assembly language, because the company had moved some of the routines in the machine's ROM. Apple also stressed the compatibility of the Apple IIe with the Apple II when it brought out the new model early in 1983. In fact, the changes Apple made in modernizing the design resulted in some incompatibilities between the two. Similarly, there are some incompatibilities between the early and later IBM PCs.

You don't even have to have a change in the model number to have incompatibility. Commodore has made several changes to its PET and 64 computers that rendered early and late machines of each sort incompatible in various ways.

Clones vs Copies

When you move from machines made by the same company to machines produced by competing companies, the picture becomes even more cloudy. That's because things like patents and copyrights enter the picture.

The machines designed to be compatible aren't copies, at least not strictly speaking. True copies of popular microcomputers are available in some parts of the world and typically sell for one-quarter to one-half of the original's list price. Just don't try bringing one back into the United States.

Doing a copy of someone else's computer down to the contents of the ROMs violates the law. The manufacturer whose machine was copied can, and will, take the copier to court. They can also get an order empowering customs officials to seize such copies being brought into the country, whether by the boatload or as under-the-seat baggage by a tourist who thinks he got a bargain.

Both Apple and Tandy have sued other computer manufacturers whose products too closely resemble their machines.

Clones, on the other hand, are designed to work like the machines they are modeled after, but aren't exact copies. Many of them don't even look like the computer they are based on and most of them include features the original model doesn't have. For example, most IBM PC clone manufacturers took the gripes of users to heart and included more expansion slots. Some of them also have a Selectric-style keyboard.

Obviously, there is a fine line between compatibility and copying, and just where that line lies is sometimes a matter of opinion. Right now, Apple is suing Franklin, claiming the ACE 1000 has copied some of the programs in the Apple ROMs.

Clones also have a varying degree of compatibility with the machine they are modeled on.

Kinds of Compatibility

Probably the lowest level of compatibility is the ability to read and write floppy disks meant for another machine. This is fairly common, even among machines that aren't intended to be compatible. The Kaypro II, for example, comes with a program that will let it read and write disks from five other machines. Another program is available from Microsolutions that will let Kaypro users read and write disks for a total of 16 other computers.

The ability to read and write disks doesn't mean the machine can run the programs on those disks. All the feature is intended to do is make it easy to interchange data between a Kaypro and the other machines. However, this can be useful if you want to swap data among different machines.

"Suppose you create a document with WordStar on an Osborne," says Lee Ryan, a senior technician in Kaypro's technical support department. "With this program you can transport those over to the Kaypro and use those files."

Kaypro doesn't claim to be compatible with anyone, but Ryan says that in many cases CP/M programs for other machines will run on the Kaypro after being transferred from disks in other formats.

"A fair number of programs will run directly, but one problem is that the program won't necessarily conform to the terminal. If the program uses special features of the original computer, it may just totally bomb out.

"There are some that are flat-out not going to work unless you alter them considerably. Professional software companies usually don't give you the source code, so for the most part it's not really worth trying to convert a program like that."

A somewhat higher level of compatibility involves using the same bus

structure and microprocessor as the target computer and using the same operating system. In the case of the IBM PC this means an 8088 microprocessor, the IBM PC bus and the MS DOS operating system. There is a fair number of computers out there with this level of compatibility with the IBM PC.

At this level you can talk meaningfully about compatibility—as long as you don't say much.

A computer with an 8088 microprocessor and the IBM PC bus running MS DOS will be able to run a fair number of PC programs, but not all of them. Not unless there is a number of other similarities, that is.

If the computer uses the display format and terminal configuration the program expects and if the program uses the operating system routines instead of trying to get at the computer's resources directly, then the program will probably work. However, that frequently isn't the case.

For example, the program may expect to display information on the screen in a certain format. Or it may require a particular function key for an operation. If the screen format is different or if the "compatible" computer doesn't have the function key, the program won't work.

A more important area of incompatibility involves the firmware—the subroutines in ROM. In theory, there is no need for a program to deal directly with the ROMs or any other part of the machine. That is the job of the operating system.

But going through the operating system gives portability and compatibility at the expense of other virtues, usually speed. As a result, there is a temptation for the programmer to write routines that bypass the operating system and call ROM routines directly.

"The biggest problem in compatibility is firmware," says Hayes. "If the machine doesn't have all the entry points and entry parameters, the program won't run.

"The software writers may not be totally satisfied with the functions available under the operating system or feel they may gain some advantage in speed. In some cases they may."

Although the contents of the IBM PC ROM is copyrighted, manufacturers of PC-compatible machines can get around that by writing their own firmware.

"You write your own ROM and you write it differently, but what goes in and what comes out is the same," says Compaq's Price. "But how it does it is different."

Hayes says that the practice of bypassing the operating system is fairly common, but he isn't sure it's a good idea.

"As an old software hack myself, I think you should try and stay away from that as much as you can," Hayes says. "There's nothing that says at a later date IBM won't change the firmware.

"Unfortunately, we're stuck in a marketplace where an enormous number of authors have done that (gone directly to the firmware). Some of the more popular packages have availed themselves of the services of the ROM firmware."

Hardware Compatibility

In terms of hardware compatibility, there tends to be more standardization, because peripherals communicate with the computer in pretty standard ways. In addition, there are standards, or at least things approaching standards, in many parts of the hardware world. For example, the Centronics parallel interface for printers has been adopted by many computer and printer manufacturers. Disk drives also tend to have standardized interfaces.

However, there are still incompatibilities in hardware, especially items that plug into the slots on the computer's motherboard.

This isn't a new problem. When the S-100 bus became established as a *de facto* industry standard, a lot of manufacturers put out "S-100-compatible" boards that wouldn't work with each other. Almost all of them would work with an Altair computer, which originated the standard, but they could interfere with each other in all sorts of strange and obscure ways.

The larger manufacturers of plug-in boards try to keep this sort of thing from happening.

"As each new machine becomes available, we try to tailor our board to fit," says David Weatherspoon, director of marketing for MBI, the company that produces the Monte Carlo multifunction board for the IBM PC. "When they released the (IBM PC) XT we had to install one circuit trace on the board."

In another case, Weatherspoon says, there was a problem with selecting the right printer port. "Originally it would try to address the line printer and get stuck. We had to have it create line printer (port) 3 and 4 instead of 1 and 2. The machine was trying to address the hardware and got confused."

Sometimes manufacturers get around the problem by providing a software patch or instructions to make things work. Franklin's Comber cited, as an example, his company's CP/M board.

"We say we're CP/M-compatible," he says. "But software written with the Microsoft board checks the firmware on the board itself. You have to convert it to our system to make it run.

"Physically what you do is format a disk in our system software and then transfer info to our files."

Most of the companies in the IBM peripheral market recognize the importance of PC lookalikes. In fact, many of the hardware and software manufacturers exchange products for evaluation to make sure everything will work together. But not all of them have the resources to make sure their products are compatible.

"When you get into the bargain-basement boards, they may not have researched the different quirks within each machine, so they might not be as compatible," Weatherspoon says.

Is It Compatible Enough?

If you're an average user, the overall question of compatibility as a concept and industry standards approaches the realm of philosophy. The only question that matters is: "Can I use this piece of hardware and software with the computer I now own?"

That's not an easy question to answer. So far no one has drawn up a chart or written a book to show what works with what. Given the speed at which new products come onto the market and at which existing products change, a book would be obsolete before it was printed anyway.

In the face of the problem, some manufacturers have just given up. "In the past week we've had three or four calls asking about compatibility," says the spokeswoman for a major software house. "Our response is that we certainly hope our programs run, but we can't guarantee it and we haven't tested it."

If a piece of software or hardware doesn't work on a lookalike, the purchaser may well be out the price of it. Under those circumstances, there is no legal obligation for any of the manufacturers involved to refund your money. You can't even count on the assurances of the salesperson unless you can get them in writing.

As a matter of company policy, many dealers and manufacturers do offer refunds if the product proves to be incompatible, but this is something that needs to be checked individually.

The best course of action is to ask the dealer or manufacturer if software and hardware are compatible. An increasing number of manufacturers are compiling lists of what will and won't work with their products.

"We go so far as to publish a monthly list available to the consumer through the dealers," says Compaq's Price. "We also distribute a monthly authorized dealer bulletin to identify those packages that work, those that work with some modification and those that don't work."

Comber says that Franklin is also in the process of compiling such a list. But he points out that because it takes a long time and because there is so much software out there, it will be a never-ending job.

"There's a lot of Apple software on the market and we're a relatively new company," he says. "We're trying to make up a reasonably sized list, but it's going to be an ever-growing project."

Further, just because such lists exist, you can't assume you will have automatic access to them. Only a few of the companies release their lists to the general public and some keep them at company headquarters. Sometimes they will answer only compatibility questions for people who have already purchased their product.

Price said that Compaq will provide its list to anyone who calls the company's 800 number. "We give out thousands of them a week," he says.

However, the fact that a piece of software or a peripheral will work on the IBM PC and the Compaq doesn't guarantee it will work on another PC lookalike.

The only sure-fire way to know if a product will work on a particular computer is to try it. If you already own the computer or the software in question, arrange for a demonstration at the store. If it's a software question, you might want to take your own machine in to make the test.

Price noted that what market analysts do at trade shows is to go around to the new lookalikes displays with copies of popular programs and try them.

Comber echoes Price's advice. "Try it," he says. "What I recommend to our customers is to try it before you buy it."

If you can't get all the elements of the computer/software system together for some reason, the next best course is to get an agreement in writing, allowing you to return your purchase if it proves to be incompatible.

Finally, you should seriously consider how significant compatibility is for your application. There is usually a number of programs capable of doing any job on the market and a number of lookalike computers in any price range. Unless you've already got a lot of data on disk, you can look around and find something that will do what you need on a machine you can afford.

With a little knowledge and some shopping around, you can protect yourself against compatibility problems. But ignorance can cause you a lot of trouble. "Remember that compatibility doesn't mean 100 percent compatibility," Comber says, "even though a lot of people make that assumption. When considering compatibility, make sure you know where compatibility ends and problems begin."■

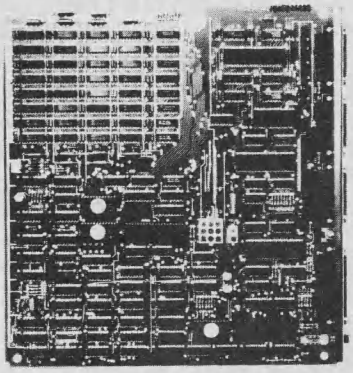
Circle 269 on Reader Service card.

Z80* SINGLE BOARD COMPUTER!

64K RAM — 80 x 24 VIDEO DISPLAY — FLOPPY DISK CONTROLLER

RUNS CP/M* 2.2!

BRAND NEW PC BOARDS WITH SCHEMATICS!



$39.95

(BLANK BOARD WITH DATA AND ROM'S.)

GROUP SPECIAL: BUY 6 FOR $205!

ALL ORDERS WILL BE PROCESSED ON A *STRICT*, FIRST COME, FIRST SERVED BASIS! ORDER EARLY!

USES EASY TO GET PARTS!

UNBELIEVABLE LOW PRICE!!! GIANT COMPUTER MANUFACTURER'S SURPLUS!

Recently Xerox Corp. changed designs on their popular 820* computer. These prime, new, 820-1 PC boards were declared as surplus and sold. Their loss is your gain! These boards are 4 layers for lower noise, are solder masked, and have a silk screened component legend. They are absolutely some of the best quality PC boards we have seen, and all have passed final vendor QC. Please note, however, these surplus boards were sold by Xerox to us on an *AS IS* basis and they will not warranty nor support this part.

We provide complete schematics, ROM'S, and parts lists. If you are an *EXPERIENCED* computer hacker, this board is for you! Remember, these are prime, unused PC boards! But since we have no control over the quality of parts used to populate the blank board, we must sell these boards as is, without warranty. You will have to do any debugging, if necessary, yourself! CP/M 2.2 for the original Big Board, sold by Digital Research Computers, P. O. Box 461565, Garland, Texas 75046, will run on this PC board without modification. It is available from them for $139 including manuals.

*CP/M TM OF DIGITAL RESEARCH INC. (CALIF.) 820 TM OF XEROX CORP. Z80 TM OF ZILOG

ADD $2 PER PC BOARD FOR SHIPPING. (USA and Canada)

B. G. MICRO

P. O. Box 280298 Dallas, Texas 75228
(214) 271-5546

TERMS: Orders over $50 add 85¢ insurance. No COD. Tex. Res. Add 5% Sales Tax. Subject to prior sale. Foreign orders: US funds only. We cannot ship to Mexico. Foreign countries other than Canada add $6 per board shipping.

The Waiting Is Over

If you're tired of killing time while your computer is tied up printing a lengthy file, salvation is on the horizon. The Microbuffer, from Practical Peripherals, will return your computer to active duty a lot quicker than you're probably used to.

By John Fail

All of us have had the experience of having to wait while a computer is tied up printing a long file. I do a lot of writing of technical manuals, and the wait allows me to get a cup of coffee or visit with the family.

That has all come to a screeching halt. I recently purchased a Practical Peripherals (PPI) MBIS serial in-line Microbuffer. As a result, we use a lot less coffee and the family doesn't see me quite as often.

What It Is

What is a print buffer? Simply put, when you give a print command to your computer the file is dumped to the buffer, which accepts the data from your computer as fast as it can be sent. Data is stored in the Microbuffer's memory and sent to the printer as fast as the printer can accept it. You can set up the bit rates to be sent at a very high speed to the buffer—19.2K bits per second, for example.

In turn, the buffer can be set to send the data to your printer at the printer's highest rate. This is a real plus for many letter-quality printers that have a maximum bit rate of 2400 bps. Since the computer dumps a lot of data at a very high rate of speed, you get control of the computer back a lot quicker.

Practical Peripherals has been in the printing buffer business for some time, manufacturing buffers for the Apple computer as well as Epson and other printers. I have had a PPI MBS8K 8Kb serial buffer in my MX-100 for more than a year and have had nothing but success with it. In addition, my MX-80 has a 16Kb parallel Microbuffer in it—again, perfect operation.

Take the Plunge

I noticed that PPI is now producing in-line Microbuffers that are not dependent upon being installed inside the printer or the computer. This appealed to me—the buffer can be placed between the computer and either of my serial printers.

The option of being able to upgrade memory in 64Kb steps all the way to 256Kb was just too much to resist! I took the plunge and purchased one.

The unit is supplied in 32Kb or 64Kb versions. The 32Kb model can be upgraded to 64Kb simply by adding four 4164 memory chips. For expansion beyond 64Kb, PPI sells 64Kb memory expansion modules that simply plug in to the main board. Expansion to 256Kb of memory is possible.

The input and output bit rates may be configured separately in standard increments from 75 bps to 19.2K bps. Bit rates are easily set up by changing jumpers.

I set my bit rate from the computer to the microbuffer at 19.2K bps and set the output to the printer at 2400 bps. The results were pretty impressive:

- Without the buffer, a 20Kb Basic program took nine minutes to list at 2400 bps and return control of the computer to me. The same file with the buffer installed using 19.2K bps to the buffer and 2400 bps to the printer, took 16 seconds to return the computer to me.
- A 16Kb program was dumped in 13 seconds.
- A 48Kb mail list data file under dBaseII, which normally takes nine minutes and 45 seconds to print without the Microbuffer, dumped the file to the Microbuffer in one minute and 50 seconds.

Pins and DIPs

Hardware handshaking is configured for both input and output by Berg jumpers. Handshaking is supported on pins 5, 11 and 20 by simply changing a jumper. Software handshaking can be implemented using a DIP switch.

Usually, data transmitted to a printer on an RS-232C line will use pin 2 to send the data to the printer. Again, jumpers are provided to change to pin 2 if you need to. These configurations are available on the input and output of the Microbuffer.

The Microbuffer is not limited to use with a printer only; it can be used with a modem. Actually, it can be used with almost any serial device. It doesn't take much imagination to come up with new uses for the Microbuffer.

Other settings that can be configured using DIP switches include:
Parity off/on
Parity even/odd
Seven or eight data bits
One or two stop bits
Software handshaking off/on
Form-feed recognition for single
Sheet printing
Reverse channel off/on

The Right Stuff

It seems the engineers at PPI have thought of all the right things to make it easy to set up the Microbuffer and get it running. It took about five minutes to get mine operating from the time I opened the box.

There are no surprises, such as

Address correspondence to John Fail, 6170 Downey Ave., Long Beach, CA 90805.

software changes or soldering. The manual is detailed and leads you through installation with ease. The silk-screened printed circuit board is laid out nicely and is well-marked where the jumpers should be installed.

The unit is small, measuring 5⅜ × 7¾ × ⅝, and weighs in at 1.5 pounds for the 256Kb unit. Power is supplied externally with a six-foot cord.

The Microbuffer is housed in an attractive beige cabinet with a jet black front panel. The only control on the back panel is the power off/on switch.

Another plus in the attention-to-detail department is the inclusion of mounting studs on the DB-25 receptacals on the rear panel. Now you can secure the connectors to the rear of the MBIS without having them work loose.

Operation of the Microbuffer is simplicity itself. The front panel uses touch-sensitive switches for controlling the Microbuffer. They conduct the following operations:

Clear: Pressing this switch stops transmission and places the MBIS in a standby-to-clear mode. Memory is cleared by transmitting the next character to the MBIS.

Copy: If you desire multiple copies of a document or file, you can touch this control up to 255 times for copies. The only requirement is that you must wait until the file has been completely sent to the buffer, then press the button for the amount of copies you desire.

Once the original file is in the MBIS memory, it will continue printing the copies and return control of the computer to you. That assumes that you have enough memory on the MBIS to hold the entire file you wish to copy.

Pause: Stops sending data to the printer. You can continue to keep sending data from the computer to the MBIS while the unit is in the pause condition.

Pass: This control allows you to load data into the MBIS memory, go around it to issue printer controls and then print the file.

Another feature that pass allows is loading data for transmission via modem, using pass to go around the MBIS for logging onto a BBS, and then transmitting the data from the MBIS. All the while you have control of your computer.

Hard to Beat

The PPI warranty is hard to beat: two years parts and labor. A warranty like that shows the manufacturer's confidence in its product.

The MBIS is a versatile unit and usable in almost any computer installation, adding great flexibility and speed. The unit is attractively styled, nicely laid out and easy to set up.

I'm totally sold on the MBIS—I don't think I could ever get along without it. Once you have used a Microbuffer you will never again be able to stand the waiting to get your computer back after a long printing operation.

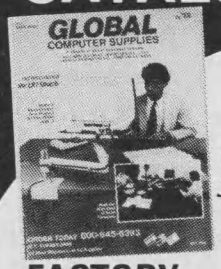
The MBIS is manufactured by Practical Peripherals, 31245 La Baya Drive, Westlake Village, CA 91362. A Centronics parallel interface model is also manufactured by PPI. Both models are available from many dealers around the country.■



The MBIS Microbuffer speeds up printing bit rates.

Circle 177 on Reader Service card.

FREE
GLOBAL
COMPUTER SUPPLIES CATALOG



Write or phone for yours and save by buying at

FACTORY — DIRECT PRICES
1-800-645-6393
NY-516-292-3400
GLOBAL
COMPUTER SUPPLIES
91V Hemlock Drive
Hempstead, N.Y. 11550

ANALOG INPUTS
ANALOG OUTPUTS
DIGITAL INPUTS
DIGITAL OUTPUTS
REAL TIME CLOCK
with battery backup
for
COMMODORE 64

DIADACS 1 is the complete real signal I/O board for the Commodore 64. It contains 16 channels of 12 bit analog input. The standard 0-10 volt range is used. **DIADACS 1** also contains a 12 bit analog output. In addition, 12 channels of TTL digital input and 12 channels of TTL digital output are provided. A Real Time Clock circuit with battery backup provides the final piece to complete a laboratory system.

DIADACS 1 is provided with a software driver package that allows access to the I/O system from user programs.

DIADACS 1 ..... $295.

SEND FOR A COMPLETE CATALOG
DEALER INQUIRIES INVITED

CGRS MICROTECH
P.O. Box 102, Langhorne, PA 19047
215-757-0284

Circle 283 on Reader Service card.

The Good, the CAD and the Apple

In the finale of this two-part article on computer-aided-design, the author shows what happens when you interface Logo to a digital plotter.

By Richard Fritzson

In the first half of this article (see last month's *Microcomputing*, p. 88) I described a package of Logo procedures that allows you to easily draw pictures on the screen and can be extended in a variety of ways. In part 2, I'll be reporting the results of interfacing that program to a digital plotter.

Digital Plotters

A digital plotter (Photo 1) is a device for drawing directly on paper by moving a pen (as opposed to printing a series of dots). It has a pen holder mounted on an arm that can move in two dimensions and raise or lower the pen. The one pictured is a Houston Instrument HiPlot Plotter Model DMP-4. The Model DMP-4's features are generally available, in one form or another, on most other plotters. This isn't a plotter review, but the HiPlot hasn't given me any mechanical trouble.

The plotter accepts commands from either a serial or parallel port to move the pen, either to an absolute location on the paper or to a place relative to the current position. Other commands raise and lower the pen, draw marks at a specific place and write text.

Like most graphics devices, it uses a Cartesian coordinate plane to specify where the pen should be moved. The origin of this plane can be defined, by a plotter command, to be anywhere on the plane. To make it similar to Logo's system, I define it to be in the center of the page (Fig. 1). The plotter has an x-axis range of plus or minus 1100 and a y-axis range of plus or minus 850.

The model shown has a multiple-pen option. When this option is installed, a simple command makes the plotter automatically put the pen it is holding in a "pen stable," pick up a pen of a different color and return to its starting position.

The commands accepted by the plotter are listed in Fig. 2. My plotter is attached to the Apple through a serial port and uses a handshaking protocol that has to be executed at least every 256 characters.

Bringing Turtle Graphics To the Plotter

Since all of the programming on this system was going to be done in Logo, I decided to use a turtle graphics approach toward programming the plotter. This makes the plotter simple to

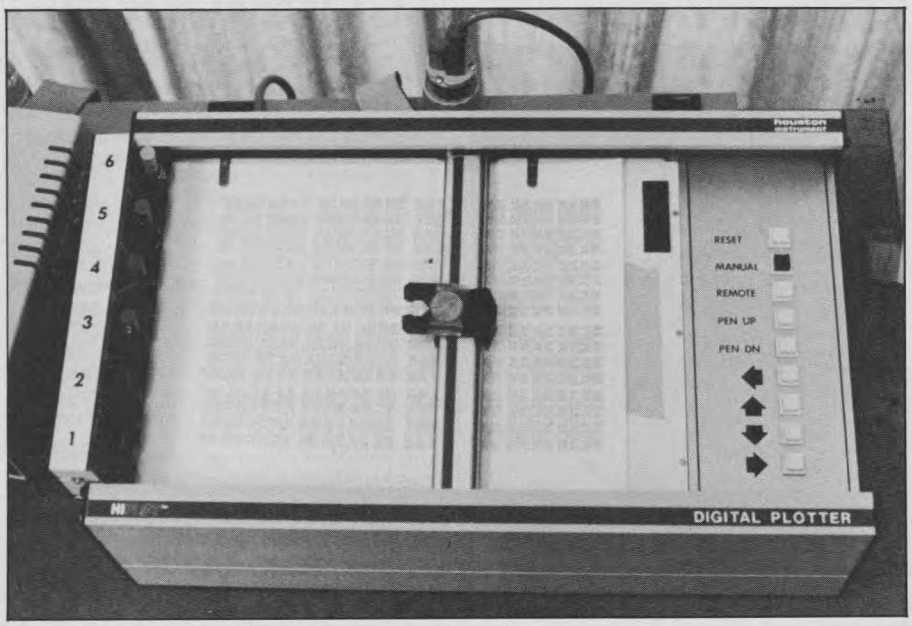


Photo 1. Houston Instrument HiPlot Plotter.

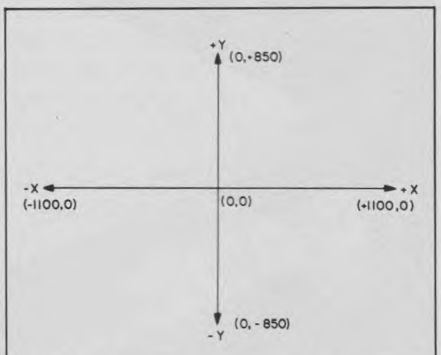
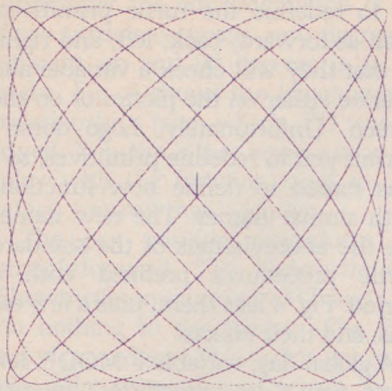
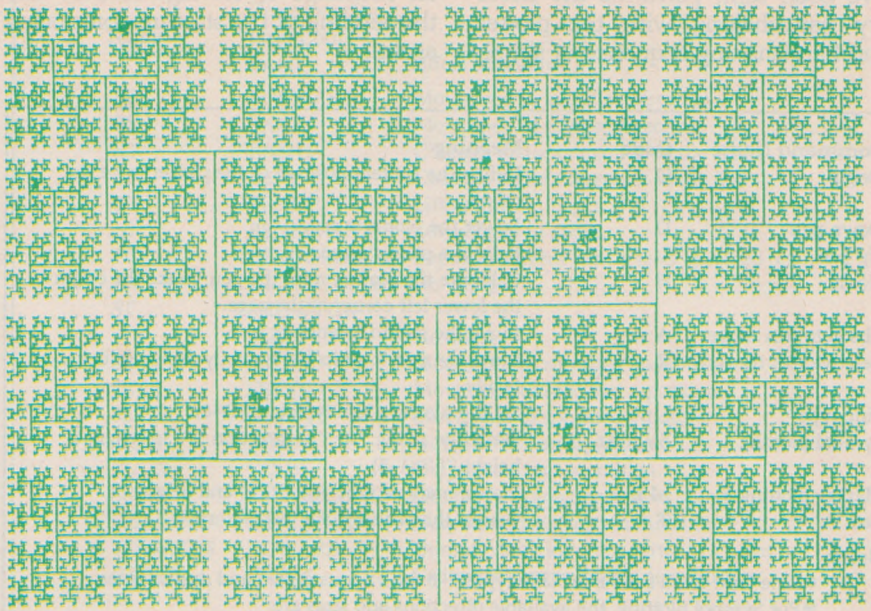


Fig. 1. The HiPlot Plotter graphics coordinate plane.

Address correspondence to Richard Fritzson, 5814 Russett Road, #4, Madison, WI 53711.





Plots 1 and 2. Examples using Logo package to draw pictures on screen.

use for anyone who already knows Logo and eliminates the need for programmers to learn the plotter's command language.

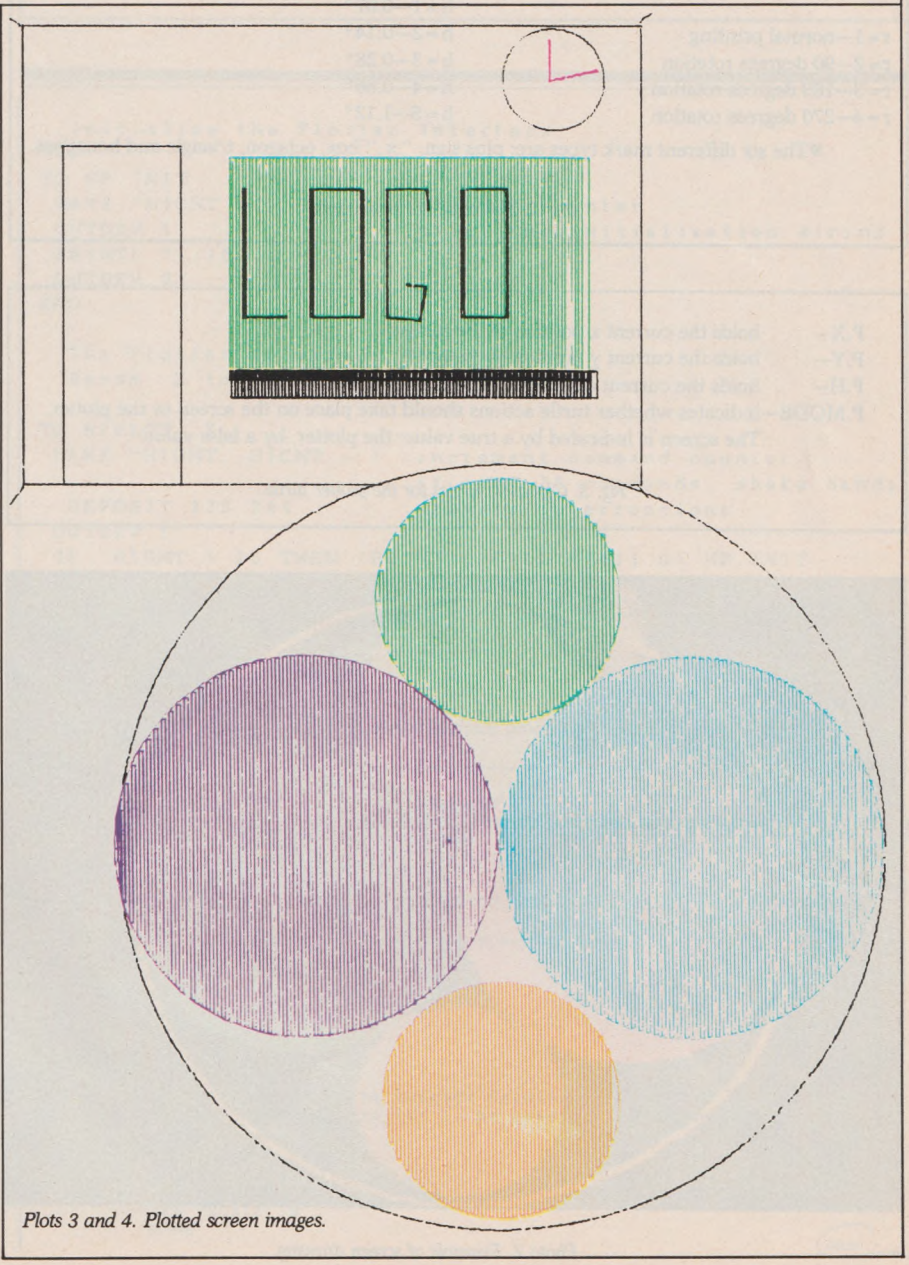
One of the nice things about turtle graphics is that it's easy to implement on any graphics device. All you have to do is maintain a model of the turtle and use a little bit of trigonometry. The following procedure can be adapted to any graphics device that can draw lines.

The standard Logo turtle has four attributes: a position on the screen, a direction, a pen of a particular color and a pen position of either up or down. The state of the plotter's turtle is kept in the set of global variables listed in Fig. 3.

The x and y coordinates are points on the plotter's Cartesian plane; the color numbers are the pen numbers in the plotter's pen stable. The pen state is true if the plotter's pen is down and false if it is up. The plotter's turtle direction is recorded using the same system used by the Logo turtle: the angle of zero degrees is straight up (in the positive y direction) and positive values for degrees are in the clockwise direction.

The first part of the program proves that Logo can easily command the plotter. Listing 1 contains two procedures, HP.INIT and HIPLOT.

HP.INIT sends some start-up commands to the plotter and initializes the value of a command counter. HIPLOT accepts a command for the plotter and sends it over a serial port. It also increments the command counter and, when a fixed number of commands



Plots 3 and 4. Plotted screen images.

have been sent, performs the necessary handshaking with the plotter. (The handshaking sequence is simply an exchange of carriage returns and the sending of the start-up commands again.)

Command Name	Code	Meaning
Origin	O	Define the current position of the plotter to be the origin.
Down pen	D	Lower the plotter's pen.
Up pen	U	Raise the plotter's pen.
Home	H	Calibrate the plotter; raise the pen; make the origin the lower left corner of the page.
Absolute pen move	A x y	Move the pen to location (x,y)
Relative pen move	R x y	Move the pen x units horizontally and y units vertically.
Line type	L n	Set the plotter's line type to n (0-8).
Symbol plotting	S r h str___	Write the string "str" in direction "r" in letters of height "h" (1-5)
Marker plotting	M h m	Plots a mark of type "m" (0-5) and height "h."
Test	T	Causes the printing of a test pattern.

Notes:

- Line type 0 is a solid line. Line types 1-8 are various dotted and dashed lines.
- For Symbol plotting, the available directions and sizes are:

	h = 1—0.07°
r = 1—normal printing	h = 2—0.14°
r = 2—90 degrees rotation	h = 3—0.28°
r = 3—180 degrees rotation	h = 4—0.56°
r = 4—270 degrees rotation	h = 5—1.12°

- The six different mark types are: plus sign, "×," box, octagon, triangle and hourglass.

Fig. 2. HiPlot plotter commands.

P.X— holds the current x position of the turtle
P.Y— holds the current y position of the turtle
P.H— holds the current direction of the turtle
P.MODE—indicates whether turtle actions should take place on the screen or the plotter. The screen is indicated by a true value; the plotter, by a false value.

Fig. 3. Global variables for the plotter turtle.

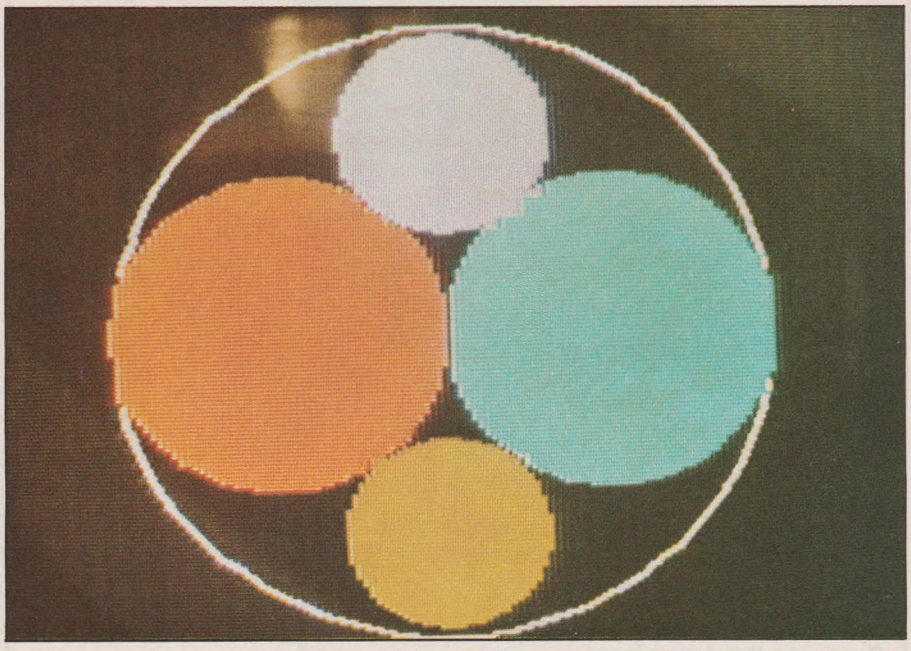


Photo 2. Example of screen drawing.

The neatest way to proceed would be to redefine the turtle primitives, such as forward, back, left, and right, so that they will check a variable and operate either on the plotter or on the screen. Unfortunately, Logo doesn't permit you to redefine primitives, so I was forced to define new functions with similar names. The new names are the abbreviations of the standard turtle procedures prefixed with a period. Fig. 4 lists them, plus a few extras, and their effects.

A global flag, variable P.MODE, lets these new "dot procedures" operate on either the screen turtle or the plotter turtle depending on the flag's value. The screen is used if P.MODE is true; the plotter is used if P.MODE is false.

Two functions are defined to set the value of P.MODE (Listing 2). Screen sets it to true, causing the dot procedures to operate on the screen; Plot sets it to false, causing them to work on the plotter. Each of these procedures also takes care of any initialization that needs to be done.

Since the plotter's plane is so much larger than the screen's plane, I introduced a scale factor that can be used to scale up all of the plotter operations so that drawings originally made on the screen will be a reasonable size.

The scale factor is a variable, however, since there are times you might want to make use of the plotter's higher resolution. Plot accepts the scale factor as input and uses it to set the value of a global variable.

Most of the package was implemented in terms of the primitive .SETXY (Listing 2). This primitive keeps the model's position variables current and sends absolute move commands to the plotter using the HIPLOT procedure. It also performs the scaling operation.

Notice that although the plotter receives integers for its move commands, the turtle model maintains its position as a floating point number, just as the screen's turtle does. The functions .XCOR and .YCOR reverse the scaling procedure so that normal, unscaled positional values are reported.

The direction-changing primitives are .SETH and .RT and .LT, which simply manipulate the model's direction variable, taking care to keep the variable between 0 and 360 degrees.

The only tricky procedure in the bunch is .FD, which uses sine and cosine functions to calculate both the x- and y-axis changes caused by forward

motion by the turtle. To understand it, remember the odd orientation of the Logo turtle's compass: zero degrees is straight up and 90 degrees is to the right. Fig. 5 shows the trigonometric relationships from which .FD was derived. You can either review it or just play with the function itself to convince yourself that it works.

The pen position procedures are straightforward. The Hideturtle and Showturtle equivalents (.HT and .ST) do nothing to the plotter. The Pencolor procedure (.PC) avoids using the pen color value of zero, which, to the plotter, means "use no pen." .PC shifts all pen color numbers up by one. .HOME recalibrates the plotter and homes the plotter turtle. .TOWARDS works the same as the standard Towards, using the plotter turtle's location and coordinate system instead of the Logo turtle's.

The HIPLOT primitive can be used to take advantage of plotter functions that have no analogous turtle procedures (for example, the .PPRINT procedure in Listing 2, which prints text on the plotter).

That's all there is to the package. It is useful by itself; it doesn't necessarily need to be connected to the Sketch package. Plots 1 and 2 show some pictures that have been drawn using the package. In fact, it is much easier to draw graphs or pictures or whatever you please using these procedures and Logo rather than Basic.

Automatic Programming

Interfacing the plotter to Logo must take us closer to using the Sketch program on the plotter, but how it has done this isn't obvious.

One method would add the "dot procedures" to the Sketch program and have the picture plotted while you draw it. For each turtle command executed, a matching plotter command would be executed.

This turns out to be mechanically awkward; the plotter is slow and it gets moved around too much. It also precludes any picture editing and it means you can't change your mind and plot after you've drawn a picture you like without plotting.

No, what you want is to be able to draw the entire picture on the screen and then say, "Now, plot this picture on the plotter."

The answer is to have the Sketch program make a record of everything it draws on the screen and then use that record to redraw the picture on the plotter. What better record could

Name	Corresponding Logo Command	Effect on Plotter
.FD	FORWARD	Moves pen in specified direction.
.BK	BACK	Moves pen in reverse direction.
.RT	RIGHT	Changes turtle's direction to the right.
.LT	LEFT	Changes turtle's direction to the left.
.PU	PENUP	Lifts pen from paper.
.pd	PENDOWN	Lowers pen to paper.
.PC	PENCOLOR	Replaces current pen, selects specified one.
.HT	HIDETURTLE	No effect.
.ST	SHOWTURTLE	No effect.
.SETXY	SETXY	Moves pen to specified coordinates.
.SETX	SETX	Moves pen to specified x position.
.SETY	SETY	Moves pen to specified y position.
.XCOR	XCOR	Outputs current x position.
.YCOR	YCOR	Outputs current y position.
.SETH	SETHEADING	Sets turtle's direction to that specified.
.HEADING	HEADING	Outputs turtle's current direction.
.TOWARDS	TOWARDS	Outputs direction from turtle to a point.
.HOME	HOME	Calibrates plotter, places pen at origin.

Fig. 4. The plotter turtle commands.

```
; Initialize the Plotter Interface

TO HP.INIT
 MAKE "HICNT 0                  ;command counter
 OUTDEV 1                       ;print the initialization string
 PRINT1 ":IOD,1,
 OUTDEV 0
END

; The Plotter Interface Routine
; Sends :X to the Plotter

TO HIPLOT :X
 MAKE "HICNT :HICNT + 1         ;increment command counter
                                ;if over 25 commands, shake hands
 .DEPOSIT 233 244               ;prevent interruptions
 OUTDEV 1
 IF :HICNT > 25 THEN (PRINT)(.CALL 49411 0) HP.INIT
 OUTDEV 1
 (PRINT1 :X "' ')               ;transmit command
 OUTDEV 0
 .DEPOSIT 233 0
END
```

Listing 1. HiPlot plotter interface procedures (File: HiPlot).

Listing 2. Turtle graphics package for the HiPlot plotter.

```
; TURTLE GRAPHICS ON THE HOUSTON INSTRUMENTS HIPLOT PLOTTER

; Make the Screen the current drawing device

TO SCREEN
 DRAW
 MAKE "P.MODE "TRUE
 MAKE "SCALE 1
END

; Make the plotter the current drawing device
;   :S the the scale factor to be used when drawing
;      on the plotter

TO PLOT :S
 MAKE "P.MODE "FALSE
 MAKE "SCALE :S
  HOME
```

More

there be than a list of all of the drawing instructions executed?

As the Sketch program executes, it calls on graphics procedures, usually those in the Shape library, to place images on the screen. If a record of just those procedures executions were kept, you would, in effect, have a program that draws the picture. And, since Logo has a primitive, Define, that turns a list of Logo instructions into a new definition, you can actually have such a program.

Each time you use the Sketch program to draw a picture, you get not only the image on the screen but a Logo procedure, defined so that it redraws the picture when executed.

This procedure, like all others in Logo, can be saved on disk, edited and used by other procedures. Once you draw the picture, you can embed a procedure for drawing all or part of it in a program. You can draw a variety of scenes for a game program, have the Sketch package produce the code for drawing each scene as a procedure, and then simply call them from your program.

Since complex drawings can be tedious to program, this *is* useful. The practice is similar to automatic programming; you show the machine what to do, and it writes a program to do it.

Listing continued.

```
  PC 1
END

TO FD :X
IF :P.MODE THEN FD :X ELSE SETXY XCOR+:X*(SIN :P.H) YCOR+:X*(COS :P.H)
END

TO BK :X
 IF :P.MODE THEN BK :X ELSE FD (- X)
END

TO RT :X
IF :P.MODE THEN RT :X ELSE SETH REMAINDER (HEADING + :X + 360) 360
END

TO LT :X
 IF :P.MODE THEN LT :X ELSE RT ( - :X )
END

TO PU
 IF :P.MODE THEN PU ELSE HIPLOT "U
END

TO PD
 IF :P.MODE THEN PD ELSE HIPLOT "D
END

TO PC :X
 IF :P.MODE THEN PC :X ELSE HIPLOT WORD "P (:X+1)
END

TO HT
 IF :P.MODE THEN HT
END

TO ST
 IF :P.MODE THEN ST
END

TO SETXY :X :Y
IF :P.MODE THEN SETXY :X :Y ELSE MAKE "P.X (:X* :SCALE) MAKE "P.Y (:Y*
IPLOT ( LIST "A ROUND :P.X ROUND :P.Y )
END

TO SETX :X
 SETXY :X YCOR
END

TO SETY :Y
 SETXY XCOR :Y
END

TO XCOR
 IF :P.MODE THEN OUTPUT XCOR ELSE OUTPUT :P.X/:SCALE
END

TO YCOR
 IF :P.MODE THEN OUTPUT YCOR ELSE OUTPUT :P.Y/:SCALE
END

TO SETH :X
 IF :P.MODE THEN SETH :X ELSE MAKE "P.H :X
END

TO HEADING
 IF :P.MODE THEN OUTPUT HEADING ELSE OUTPUT :P.H
END

TO TOWARDS :X :Y
 IF :P.MODE THEN OUTPUT TOWARDS :X :Y ELSE OUTPUT 90-( ATAN :Y - YCOR :X
R )
END

TO HOME
 IF :P.MODE THEN HOME ELSE HP.INIT SETH 0 HIPLOT [HA 925 700 0] PD
END

; PPRINT :ORIENTATION :SIZE :STRING
; Plots the string at current location using
;  characters of specified orientation and size.

TO PPRINT :O :S :STR
 HIPLOT LIST WORD "S :O*10+:S WORD :STR CHAR 95
 SETXY XCOR YCOR
END
```

New and Improved

The new, revised Sketch package is shown in Listing 3. The main change is in all of the procedures that call the drawing procedures (Dots, Lines, Rectangles and so on). Instead of directly calling the appropriate shape procedures, these now call a procedure, Do, that takes a Shape procedure, and the inputs to that procedure, as its own inputs.

The procedure Do evaluates the arguments to the Shape procedures; that is, it finds their values (using Run), and constructs a list that, when run, invokes the Shape procedure on these

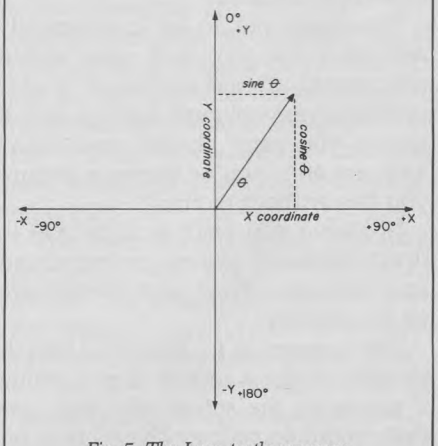


Fig. 5. The Logo turtle compass.

values. For example, it converts the inputs

[.LINE :X :Y P.XS P.YS]

to something like

[.LINE 5 10 4 17].

The subprocedures that do this, FNCALL and P, are complex not because the job is difficult, but because of some minor bugs in the implementation of Terrapin Logo.

One bug concerns the evaluation of negative numbers. Terrapin Logo gives overly high priority to its interpretation of the minus sign as a two-input procedure. For example, an expression such as

.DOT 5 -7

which you intend to be a call to .DOT with arguments 5 and -7, will fail, causing an error message. .DOT needs more inputs because Logo interprets 5-7 as -2 and then looks for the second argument. You have to write

.DOT 5 (-7)

to get it to work properly. This applies to all input to the function Run, not just typed commands. Consequently, the function P was written to parenthesize negative numbers in the programs.

The other complication, some awkward uses of the Sentence procedure, is due to problems with Sentence and List that made it difficult to use them with other than two arguments. These problems may be corrected by Terrapin, in which case FNCALL and a few other procedures can be simplified.

After evaluating the input list, Do appends the newly created procedure call onto a global list, stored in the variable Picture, and then executes it (using Run).

The remaining new procedure, Name Picture, uses this list and the Logo primitive Define to ask the user for a name for the picture and defines a procedure with that name that executes the list of instructions.

Actually, because at this point the package is pushing the limits of Logo's memory, the version of Name Picture used is one of the two presented in Listing 4. The first one erases the Menu package before doing the Define and reloads it afterwards. Since the disk operations clear the graphics screen, you can do a Name Picture operation only once on a drawing.

The second version of the procedure goes through the following steps:

Listing 3. Revised "automatic programming" Sketch package (File: Sketch).

```
; LOGO/HIPAD SKETCH PROGRAM

; SKETCH - MAIN ROUTINE. BEGINS
;  SKETCHING PROGRAM

TO SKETCH
 FULLSCREEN RESET                    ;adopt clear graphics screen
 DOTS                                ;start in DOT mode
 MAKE "S.SIZE MSIZE "S 23            ;calculate menu size
 SETSHAPE :CROSS SIZE 4              ;use a size 4 cross hairs
 SKLOOP
END

; SKLOOP - THE SKETCH CONTROL LOOP
;  A Good Place to restart if something went wrong and you
; don't want to lose the picture.

TO SKLOOP
 GETPT1   ;get first point
          ;if not at left margin, run current mode procedure
          ;else offer the menu  NOTE: left margin varies depending
          ;on pointing device
 IF P.XS > -137 THEN RUN :MODE ELSE SKRUN SELECT "S :S.SIZE
 SKLOOP
END

; RUN the selected procedure with the graphics screen

TO SKRUN :N
 FULLSCREEN
 RUN (LIST THING WORD "S :N)
 FULLSCREEN
END

; THE INITIAL SKETCH MENU

MAKE "S0 "QUIT                       ;exit program
MAKE "S1 "RESET                      ;clear the screen
MAKE "S2 "DOTS                       ;select DOT mode
MAKE "S3 "LINES                      ;select LINE mode
MAKE "S4 "CIRCLES                    ;select CIRCLE mode
MAKE "S5 "'SHADED CIRCLES'           ;select SHADED CIRCLE mode
MAKE "S6 "RECTANGLES                 ;select RECTANGLE mode
MAKE "S7 "'SHADED RECTANGLES'        ;select SHADED RECTANGLE mode
MAKE "S8 "'PEN COLOR'                ;change pen color
MAKE "S9 "'BACKGROUND COLOR'         ;change background color
MAKE "S10 "'SAVE PICTURE'            ;save picture
MAKE "S11 "'RETRIEVE PICTURE'        ;reload picture

; QUIT - EXIT THE SKETCH PROGRAM
TO QUIT
 SETSHAPE 0 SIZE 1          ;restore the turtle
 RESET                      ;reset the graphics screen
 NODRAW                     ;return to text screen
 TOPLEVEL
END


; RESET - CLEAR THE PICTURE
TO RESET
 CS BG 0 PC 1               ;clear the screen
 MAKE "PICTURE [[CPC 1]] ;initialize the global picture variable
END

; DOTS - SET MODE TO DOTS
TO DOTS
 MAKE "MODE [DO [.DOT :X1 :Y1]]
END

; LINES - SET MODE TO LINES
TO LINES
 SETMODE ".LINE
END

; CIRCLES - SET MODE TO CIRCLES
TO 'CIRCLES'
 SETMODE ".CIRCLE
END

; SHADED CIRCLES - SET MODE TO SHADED CIRCLES
TO 'SHADED CIRCLES'
 SETMODE ".FCIRCLE
END
```

More

Listing continued.

```
; RECTANGLES - SET MODE TO RECTANGLES
TO RECTANGLES
 SETMODE "RECTANGLE
END

; SHADED RECTANGLES - SET MODE TO SHADED RECTANGLES
TO 'SHADED RECTANGLES'
 SETMODE "BLOCK
END

; SETMODE - SET MODE TO [GETPT2 DO [:FN :X1 :Y1 HP.XS HP.YS]]
; USED BY ALL TWO DIMENSIONAL SHAPE MODES

TO SETMODE :FN
 MAKE "MODE (LPUT (FPUT :FN [:X1 :Y1 HP.XS HP.YS]) [GETPT2 DO])
END

; CHANGE PEN COLOR
TO 'PEN COLOR'
 DO [CPC COLOR]
END

; CHANGE BACKGROUND COLOR
TO 'BACKGROUND COLOR'
 DO [CBG COLOR]
END

TO CPC :C
 PC :C
END
MAKE "C4 "ORANGE
MAKE "C5 "BLUE
TO CBG :C
 BG :C
END

; USE COLOR MENU TO SELECT A COLOR
TO COLOR
 OUTPUT SELECT "C 5
END

; SAVE BINARY PICTURE
TO 'SAVE PICTURE'
 SAVEPICT GETNAME
END

; RETRIEVE BINARY PICTURE
TO 'RETRIEVE PICTURE'
 RESET READPICT GETNAME
END

TO GETNAME
 TEXTSCREEN
 PRINT1 "' ENTER PICTURE NAME: '
 OUTPUT FIRST REQUEST
END

; The simple version of define a picture program

TO 'NAME PICTURE'
 DEFINE GETNAME FPUT [] :PICTURE
END

; ADD AN OPERATION TO THE PICTURE LIST
TO PPUT :L
 MAKE "PICTURE LPUT :L :PICTURE
END

; ADD AN OPERATION TO THE PICTURE LIST
; AND EXECUTE IT
TO DO :L
 PPUT (FNCALL BF :L (LIST FIRST :L))
 RUN LAST :PICTURE
END

TO FNCALL :L :M
 IF :L = [] THEN OUTPUT :M
 OUTPUT FNCALL BF :L (SE :M P RUN (SE FIRST :L []))
END

; PARENTHESIZE NEGATIVE NUMBERS (THANKS ALOT TERRAPIN!)
TO P :V
 IF :V < 0 THEN OUTPUT (LIST "( :V ") ) ELSE OUTPUT (LIST :V)
END
```

1. Save the picture using SAVEPICT.
2. Erase the Menu package.
3. Name that picture.
4. Reload the Menu package.
5. Reload the picture using READPICT.
6. Change the global list of procedure calls on the variable Picture so that all it does is invoke the newly defined function.
7. Continue.

Although this takes a while to execute, it works. Photos 2 and 3 show screen drawings and Figs. 6 and 7 show the procedures generated by the Sketch package.

One of the bonuses of this method is that you can edit these functions. If your hand or eye was off slightly while you were drawing, or if you want to try out minor variations of the picture, you can make the changes to this function and use it.

But What About the Plotter?

What about the original problem—interfacing the plotter to the Sketch package? Basically, it's all done. In theory, all that's required is to rewrite the Shapes library of picture procedures, using the plotter's turtle procedures (the "dot procedures"), and then use them. In practice, however, two separate libraries of procedures are kept, partly because there isn't enough memory to keep the Sketch package and the plotter procedures resident at the same time, and partly because the solid fill algorithms (in Block and FCircle) used on the screen are not appropriate for the plotter.

Listing 5 contains those procedures in the PLOT.SHAPES file. These procedures are actually different from their counterparts in the Shapes file; the others can be reconstructed by simply replacing all turtle procedures with matching dot procedures.

To make everything work, you may have to tinker with the order of pens in the pen holder. We used red, black, green, orange, violet and blue, which is all right except that red, which is not available on the screen, replaces black, which is invisible on the

```
; THE COLOR MENU

MAKE "C0 "BLACK
MAKE "C1 "WHITE
MAKE "C2 "GREEN
MAKE "C3 "VIOLET
```

screen.

To plot a picture you have drawn on the screen, follow these steps:

1. Name the picture with the Name Picture option.
2. Exit the Sketch program.
3. Clear memory except for the newly named program. Do this by either saving the individual procedure on disk (using PSave), clearing memory and reloading it or by editing the new procedure, leaving the editor with control-G, clearing memory and then retrieving the function from the Edit buffer (just type EDIT and exit with control-C).
4. Load the plotter functions (PLOT-.SHAPES and HIPLOT)
5. Type PLOT with an appropriate scaling factor (4 or 5 is about right).
6. Type your procedure name.
7. Watch the plotter go.

Plots 3 and 4 show two plotted screen images. The shading algorithms produce a nice colored effect.

Problems and Possibilities

That's the whole package. You can now draw pictures on the screen, automatically generate Logo procedures that draw the pictures and plot them on the plotter. You can extend the library of shapes by adding new picture procedures to the Shapes and PLOT.SHAPES files (and adding options to the menu in Sketch).

One major defect of the whole package is that the Apple doesn't allow the display of text on the graphics screen. So, for technical drawings, you can't put labels on parts. On a commercial system, this would be unforgivable, but for a classroom demonstration, it is just a nuisance.

Another problem is that Terrapin Logo (which I really do like) has some bugs in it. Occasionally, I get the message LOGO SYSTEM BUG, which means I have to reload the system from scratch. We can only hope that this will be corrected soon (and complain steadily if it isn't).

A third problem is that this package pushes the memory limits of a 48Kb Apple with a 16Kb language card. It may be possible to make it smaller, but not too much smaller (unless you drop the menu package and replace it with a labeled keypad). Rumor has it that Logo implementations that take advantage of the new 128Kb Apple memory cards will soon appear to relieve this problem.

Instead of waiting for this, I am currently rewriting the package in iLISP, a LISP dialect for the Z80 that runs under CP/M. This provides more memory, a higher resolution screen and the ability to display both text and graphics on the screen. Some of the extensions I am considering include:

1. An Undo option on the menu to undo the last item drawn. This can easily be added to the current version

```
; Erase Menu Package and Clear screen before Defining
  Function
TO 'NAME PICTURE'
 KILLMENU                                    ;erase menu package
 DEFINE GETNAME FPUT [] :PICTURE             ;define function
 RESET                                       ;clear picture
 READ "MENU                                  ;reload menu
END

; Save picture before reloading Menu Package

TO 'NAME PICTURE'
 KILLMENU
 MAKE "FNNAME GETNAME
 DEFINE :FNNAME FPUT [] :PICTURE
 SAVEPICT "'XXXXXXX'
 MAKE "PICTURE (LIST (LIST :FNNAME))
 READ "MENU
 READPICT "'XXXXXXX'
 ERASEPICT "'XXXXXXX'
END
```

Listing 4. Two alternative definitions of Name Picture (File: Sketch).

```
; SKETCH SHAPE LIBRARY
;   MODIFIED FOR USE ON HIPLOT PLOTTER

TO FRCIRCLE :R :X1 :Y1
  PU SETXY ( :X1 - :R ) :Y1
  SETH 90
  HT PD
  FD 1
  REPEAT :R-1 [ SETY :Y1+SQRT( :R* :R-SQR( XCOR-:X1)) FD 1 SETY :Y1-SQRT( :R* :R-S
QR( XCOR-:X1)) FD 1]
  ST
END

TO CPC :X1
  PC :X1
END

TO CBG :X1
END

TO SQR :X1
 OUTPUT :X1* :X1
END
```

Listing 5. Modified shape library routines for plotter use (File: Plot Shapes).

Circle 341 on Reader Service card.

H-1000 **A Z80/8086 UPGRADE FOR THE H89/Z89**

HARDWARE

- plug-in replacement for the H89/Z89 CPU board; no modifications required
- dual CPUs: Z80 and 8086
- 128K RAM standard; sockets for 256K, memory expansion bus for up to 1 megabyte RAM
- 5 I/O slots
- faster program execution: 2/4 MHz for Z80, 8MHz for 8086
- fully compatible with all Heath/Zenith peripherals

SOFTWARE

- runs all Heath/Zenith software without modification
- compatible with Zenith Z 100 and IBM PC
- choice of MSDOS or CP/M-86 for the 8086
- supplied with diagnostic software package
- "ghost disk" feature: copies an entire disk in RAM for instant disk access
- supports multi-user and multi-task operating systems

TMSI Technical Micro Systems Inc. (313) 994-0784
P.O. Box 7227, Dept. H • 336 Cloverdale • Ann Arbor, Michigan 48107

Circle 17 on Reader Service card.

GLOUCESTER COMPUTER

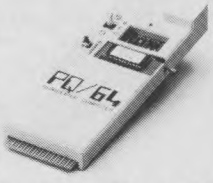
Tools for learning and dedicated applications programming.

PROMQUEEN Write code for most common 8-bit microprocessors, test it in circuit, and burn it on EPROM with this all-in-one micro development system cartridge. Powerful machine code editor provides comprehensive ROMware development support. Ideal for robotics, process control, game development. Commodore VIC-20 host computer. Programs 2716, 2732, 2758 EPROMS and similar EPROMS.



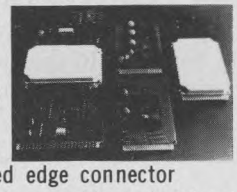
$199.00

PQ/64 all features of Promqueen less mimic mode. Software enhanced to include EPROM QC utilities, RS-232 communication, printouts. 28 pin ZIF socket. Reads, edits runs and programs all 5 volt 2500 and 2700 series EPROMS plus variety of EEPROMS all without personality modules. Commodore C-64 host computer. **$299.00**



PQ/64 RS pack performs RS-232 voltage conversions for PQ/64 system. **$49.00**

Plug your applications software into Commodore's computers on Gloucester Computer ROM Packs. Our top quality ROM cartridges include



- bypassing on all chips
- low noise layout with ground plane
- solder mask and gold plated edge connector
- wave soldered assembly and solvent cleaning
- DIP switch for address selection

VIC-20 versions include model V-8 for two 2732 EPROMS and model V-16 for 4 2732 EPROMS. C-64 versions include model C-16 for four 2732 EPROMS and model B-16 for two 2764 EPROMS.

All products shipped with comprehensive documentation. Call our user hotline **617-283-7719** or write for information: Gloucester Computer, 1 Blackburn Center, Gloucester, MA 01930.

by erasing the last item from the Picture list, clearing the screen and running the Picture list (one item at a time). The Undo option can be called repeatedly.

2. Picture editing. I am looking at ways to reference individual elements of the picture and delete them or change their parameters without having to name the picture and edit the text of the procedure.

3. Relative pictures. Changing the generated procedures so that all lines and shapes are relative to a point, which is given to the procedure as input. This would let you redraw your picture at different places on the screen.

4. Automatic installation of new shapes. Since this program was intended for use by nonprogrammers (although I enjoy it), it could be made easier to extend by writing a program that accepts the name of a Logo procedure that draws a shape and installs it in the Sketch package by adding it to the Shape file, the PLOT.SHAPE file and the Sketch menu.■

```
TO SCHOOLROOM
 RECTANGLE ( - 99 ) 70 85 ( - 67 )
 RECTANGLE ( - 87 ) 34 ( - 52 ) ( - 67 )
 LINE ( - 100 ) ( 70 ) ( - 140 ) ( 101 )
 LINE ( - 99 ) ( - 68 ) ( - 140 ) ( - 119 )
 LINE ( 85 ) ( 71 ) ( 134 ) ( 115 )
 LINE ( 84 ) ( - 67 ) ( 127 ) ( - 119)
 FCIRCLE 59 54 74 52
 BLOCK ( - 37 ) ( - 33 ) 72 ( - 41 )
 CPC 2
 BLOCK ( - 38 ) ( - 36 ) 69 30
 CPC 0
 LINE 58 54 72 57
 LINE 58 54 58 66
 CPC 1
 DOT ( - 61 ) ( - 19 )
 LINE ( - 33 ) 21 ( - 33 ) ( - 17)
 LINE ( - 33 ) ( - 17 ) ( - 21 ) ( - 17 )
 RECTANGLE ( - 13 ) 21 2 ( - 17)
 LINE 10 21 21 21
 LINE 21 21 22 15
 LINE 9 21 9 ( - 17 )
 LINE 9 ( - 17 ) 19 ( - 18 )
 LINE 19 ( - 18 ) 21 ( - 8 )
 LINE 21 ( - 8 ) 15 ( - 17 )
 RECTANGLE 32 21 45 ( - 17 )
END
```

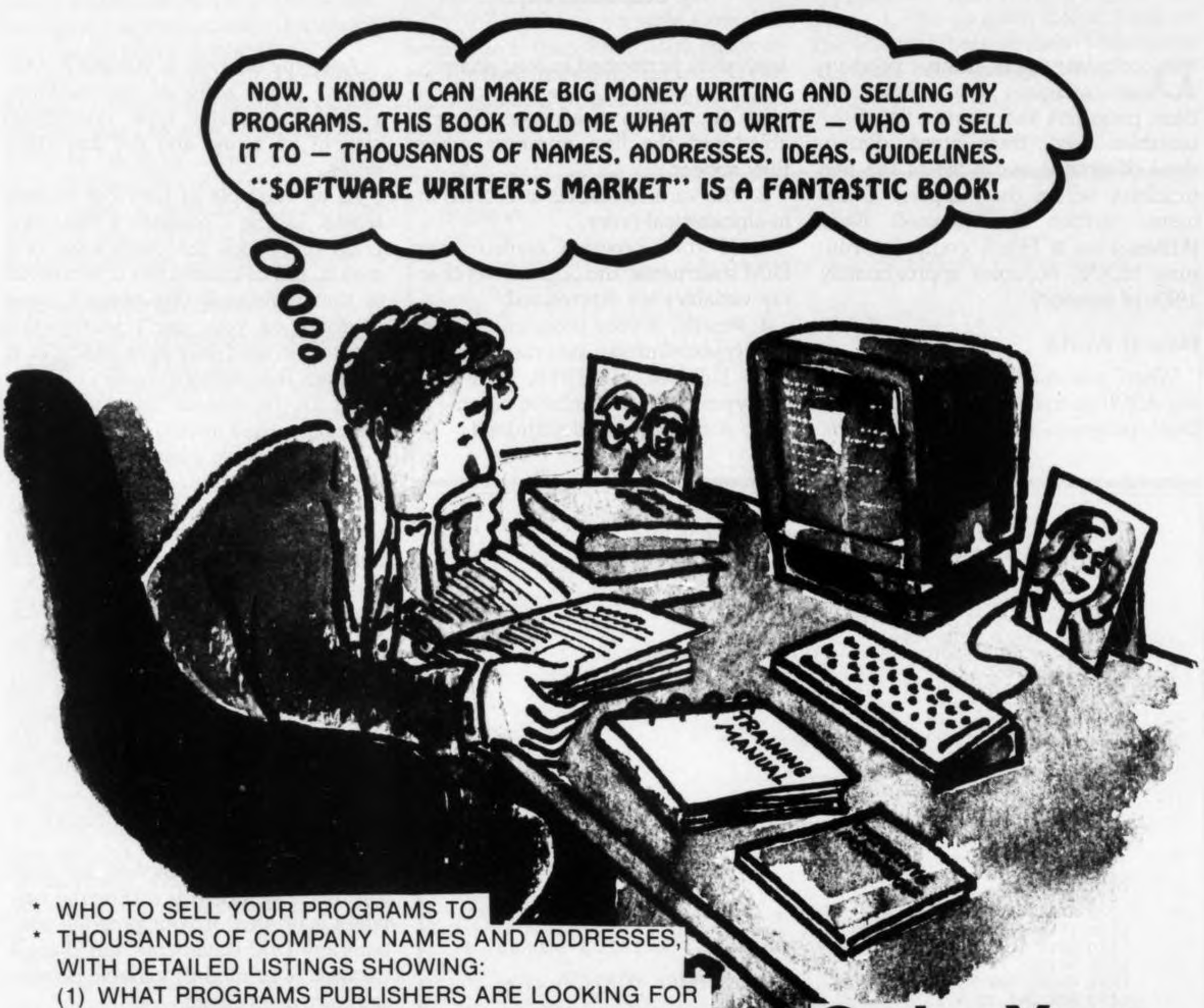
Fig. 6. Procedure created by Sketch to redraw Photo 2.

```
TO BALLOONS
 CPC 1
 CIRCLE ( - 3 ) 0 97 0
 CPC 5
 FCIRCLE 47 0 ( - 3 ) 0
 CPC 4
 FCIRCLE ( - 54 ) 1 ( - 4 ) 0
 CPC 2
 FCIRCLE ( - 4 ) ( - 65 ) ( - 4 ) ( - 96 )
 CPC 3
 FCIRCLE ( - 3 ) 65 ( - 4 ) 97
END
```

Fig. 7. Procedure created by Sketch to redraw Photo 3.

programmer s

READ THIS...



* WHO TO SELL YOUR PROGRAMS TO
* THOUSANDS OF COMPANY NAMES AND ADDRESSES, WITH DETAILED LISTINGS SHOWING:
  (1) WHAT PROGRAMS PUBLISHERS ARE LOOKING FOR
  (2) HOW THEY WANT YOU TO SUBMIT YOUR PROGRAM
  (3) HOW MUCH THEY PAY — AND WHEN!
* 100 CATEGORIES — FROM "ACCOUNTS RECEIVABLE" TO "GAMES" TO "VIDEO CONTROL" PROGRAMS
* HOW TO WRITE CLEAR DOCUMENTATION
* DEBUGGING TECHNIQUES

Enclose check or money order for $19.95 (No C.O.D.'s) to:

IPF Publications
146 Country Club Lane
Pomona, NY 10970
(914) 354-5585

Order Your Copy Today!

Name .....

Address .....

City..... **State**..... **Zip**.....

Circle 99 on Reader Service card.

A Utility You Can't Refuse

Document is a utility program that analyzes your Microsoft Basic program and prints a detailed report of its variables. No MBasic programmer should be without it.

By Stephen Auyer

Document is a utility program that analyzes your Microsoft Basic programs and prints a list of the variables used, their types, dimensions (if arrays) and a list of the line numbers where they appear. Document, written in Microsoft Basic (MBasic) on a Heath computer running HDOS, occupies approximately 19Kb of memory.

How It Works

When you run Document, it reads the ASCII-format file containing your Basic program and analyzes it. The analysis is performed in four phases:

1. Your program is scanned to determine the names of all program variables and the line numbers where they appear.

2. The variable names are sorted into alphabetical order.

3. If your program contains any DIM statements, the dimensions of array variables are determined.

4. Finally, if your program contains any type-definition statements (DEFINT, DEFDBL, DEFSTR, DEFSNG) the types of the variables appearing in these statements are determined.

After the analysis is complete, Document prints a list of the variables, giving the variable type, the dimension (if an array) and the line references.

As an example of how the process works, Listing 1 contains a Basic program that reads the coefficients of a matrix and calculates the determinant of that matrix. If this doesn't mean anything to you, don't worry—this program is used only as an example. A program that prepares mailing lists or plays Tic-Tac-Toe or Star Trek could have been used instead.

Listing 2 shows what happens when you run Document. It first prints its name and then asks you for the name of the program you wish to analyze. In this case, the program was stored on disk under the name DETERM. (Actually, it's stored as DETERM.BAS, but if you leave off the extension, Document adds .BAS to the name.)

Document then prints out the line numbers of the statements as it examines each one. This is helpful, for the scanning process can take up to ten seconds or so for each line, and it's nice to have a progress report of what's happening.

After the scan is complete, the message that Document is sorting the variables is printed. If your program contains any DIM statements, the Phase 3 message is printed as variable dimensions are determined.

Finally, if any types of definition statements are encountered, the Phase 4 message is printed as variable types are determined.

After all of this has taken place, Document prints a sorted list of the variables. Thus, you can see that variable A has been typed as double-precision, that it is an array dimensioned for 100 elements and that it's referred

```
1000 REM - CALCULATE THE DETERMINANT OF A MATRIX
1010 DIM A(10,10)
1020 DEFDBL A-D,R
1030 DEFINT I-N
1040 REM - INPUT THE MATRIX
1050 INPUT "MATRIX DIMENSION (X-BY-X), X=";N
1060 IF N<=10 GOTO 1090
1070 PRINT "DIMENSION T-O-O-O LARGE, 10 MAXIMUM."
1080 GOTO 1050
1090 REM - INPUT MATRIX COEFFICIENTS
1100 FOR I=1 TO N
1110 FOR J=1 TO N
1120 S$=" A("+STR$(I)+","+STR$(J)+") = "
1130 PRINT S$;
1140 INPUT "";A(I,J)
1150 NEXT J
1160 NEXT I
1170 REM - NOW CALCULATE DETERMINANT
1180 DET=1
1190 FOR K=2 TO N
1200 L=K-1
1210 IF A(L,L)<>0 GOTO 1310
1220 FOR I=K TO N
1230 IF A(I,L)<>0 GOTO 1270
1240 NEXT I
1250 DET=0
1260 PRINT "MATRIX IS SINGULAR, NO DETERMINANT EXISTS.": STOP
1270 FOR J=1 TO N
1280 SWAP A(J,L),A(J,I)
1290 DET=-DET
1300 NEXT J
1310 FOR I=K TO N
1320 R=A(I,L)/A(L,L)
1330 FOR J=K TO N
1340 A(I,J)=A(I,J)-R*A(L,J)
1350 NEXT J
1360 NEXT I
1370 NEXT K
1380 FOR L=1 TO N
1390 DET=DET*A(L,L)
1400 NEXT L
1410 PRINT "DETERMINANT = ";DET
1420 STOP
1430 END
```

Listing 1. Program for calculating the determinant of a matrix.

Address correspondence to Stephen Auyer, 65 Pollock Ave., Pittsfield, MA 01201.

to in nine different lines, beginning with line 1010 and ending with line 1390. This process is repeated for the remaining nine variables, ending up with S$, a string variable that is referred to in only two lines.

After the listing is complete, Document asks whether you wish to see a listing of the frequency of usage for certain keywords in your Basic program. For this example, the response was yes, so the table was printed. You probably won't want to use this feature of Document much; it's most useful if you want to optimize Document for your particular applications.

Listing 3 contains the Document program. When running under HDOS MBasic, this program occupies about 19Kb of memory. With that, along with DOS and the MBasic interpreter, you'll need a system with at least 48Kb of memory. It's possible to reduce this a bit, as I'll describe later.

Document Organization

Document is organized as follows:

Lines 1000–1490 set up and store the various delimiters and keywords used by MBasic. If you're using a different interpreter, you may need to change a few of these.

Lines 1500–1590 open the disk file that contains the program you wish to analyze.

Lines 1640–1800 read one line of your program from the disk, eliminating all quoted strings and all blanks. Note that your program must be stored in ASCII format. Since MBasic can store your program in either an ASCII or a compressed format, you must specify ASCII format by using a save command of the form SAVE "DETERM",A.

From the compressed program line stored in L$, lines 1810–1880 pick out a statement. Remember that MBasic allows multiple-statement lines with the individual statements separated by a colon.

If the statement has a line number, lines 1890–2010 find it.

The real work of Document begins in lines 2020–2910, which break the statement into words. A word is any combination of characters between two delimiters (equal sign, plus sign, parenthesis, semicolon and so on). The Basic statement Y=20*SIN(X3) consists of three words: Y, SIN and X3. Obviously, the word SIN is not a variable, but a keyword for a built-in Basic function, so lines 2220–2740 check to see whether the word is a variable name or a Basic keyword.

Lines 2920–3130 double-check to make sure that the variable name that the program thinks it's found does not contain any embedded Basic keywords. This can happen when you have a Basic statement that doesn't use delimiters to separate words.

As an example, the statement IF X AND Y1 THEN GOTO 2030 would be decoded by the program to a variable name of XANDY1THENGOTO. Lines 2920–3130 screen out any embedded Basic words to leave X and Y1 as the correct variable names.

Once a legitimate variable name has been found, lines 3140–3400 check to see whether this name has been previously found. If it hasn't, both the variable name and the line reference are stored. If the name has been previously found, only the line reference is stored.

Once this process is repeated for all of the lines of your program, Phase 1 of Document is complete and lines 3410–3590 sort the variable names into ascending order.

Gazing at Phase 3

Phase 3 of the program, lines 4150–4560, determines the dimensions of any array variables. If any DIM statements were encountered in Phase 1, the program keeps track of the line numbers of these statements and goes back during Phase 3 to decode the statements and calculate dimensions.

```
DOCUMENT
--------

THIS PROGRAM DOCUMENTS THE VARIABLES USED IN A 'BASIC' PROGRAM


NAME OF FILE IS ? DETERM

PHASE 1: DETERMINING PROGRAM VARIABLES
         PROCESSING PROGRAM LINE NUMBER:

       1000   1010   1020   1030   1040   1050   1060   1070
       1080   1090   1100   1110   1120   1130   1140   1150
       1160   1170   1180   1190   1200   1210   1220   1230
       1240   1250   1260   1270   1280   1290   1300   1310
       1320   1330   1340   1350   1360   1370   1380   1390
       1400   1410   1420   1430
PHASE 2: SORTING VARIABLES
PHASE 3: DETERMINING ARRAY DIMENSIONS
PHASE 4: DETERMINING VARIABLE TYPES
 VARIABLE      TYPE      SIZE      LINE REFERENCES
 --------      ----      ----      ---------------

 A             DBL       100       1010   1020   1140   1210   1230   1280
                                   1320   1340   1390
 D             DBL       1         1020
 DET           DBL       1         1180   1250   1290   1390   1410
 I             INT       1         1030   1100   1120   1140   1160   1220
                                   1230   1240   1280   1310   1320   1340
                                   1360
 J             INT       1         1110   1120   1140   1150   1270   1280
                                   1300   1330   1340   1350
 K             INT       1         1190   1200   1220   1310   1330   1370
 L             INT       1         1200   1210   1230   1280   1320   1340
                                   1380   1390   1400
 N             INT       1         1030   1050   1060   1100   1110   1190
                                   1270   1380
 R             DBL       1         1020   1320   1340
 S$            STR       1         1120   1130

DO YOU WANT A FREQUENCY OF USEAGE TABLE ? YES

          KEY WORD    USEAGE
          --------    ------

            IF          3

            TO          5
            FOR         8
            DIM         1
            NEXT        8
            SWAP        1
            STR$        2
            PRINT       4
            INPUT       2
            DEFINT      1
            DEFDBL      1

END OF PROGRAM
BREAK IN 4090
OK
```

Listing 2. Program showing variables used in Document.

Listing 3. The Document program.

```
1000 REM - PROGRAM TO DOCUMENT A 'BASIC' PROGRAM
1010 CLEAR 1000
1020 DEFINT A-Z
1030 PRINT "   ": PRINT "   "
1040 PRINT "DOCUMENT": PRINT "--------": PRINT "   "
1050 PRINT "THIS PROGRAM DOCUMENTS THE VARIABLES USED IN A 'BASIC' PROGRAM"
1060 DIM V$(100),NR(100),R(25,100),C(100),D(15),T$(100),DI(25),SZ(100),DG(5)
1070 DIM D2$(6),N2(6),D3$(33),N3(33),D4$(25),N4(25),D5$(12),N5(12),D6$(8),N6(8)
1080 DIM DV(25),JJ(4),J$(4),Q2(6),Q3(33),Q4(25),Q5(12),Q6(8)
1090 REM - STORE THE DELIMITERS USED BY 'BASIC'
1100 FOR I=1 TO 15
1110 READ C$: D(I)=ASC(C$)
1120 NEXT I
1130 DATA ",",=,(,),-,+,>,<,:,.,\,#,*,/,"^"
1140 REM - 2-DIGIT COMMANDS
1150 I2=4
1160 FOR I=1 TO I2
1170 READ D2$(I),N2(I)
1180 NEXT I
1190 DATA IF,1,TO,1,OR,1,ON,1
1200 REM - 3-DIGIT COMMANDS
1210 I3=29
1220 FOR I=1 TO I3
1230 READ D3$(I),N3(I)
1240 NEXT I
1250 DATA FOR,1,LEN,2,TAB,2,AND,1,DIM,1,VAL,2,EOF,2,NOT,1,ABS,2,ASC,2
1260 DATA ATN,2,COS,2,FIX,2,FRE,2,GET,2,IMP,1,LOF,2,MOD,1,OUT,2,POS,2
1270 DATA RND,2,SGN,2,SQR,2,TAN,2,USR,3,XOR,1,LOG,2,LOC,2,LET,1
1280 REM - 4-DIGIT COMMANDS
1290 I4=25
1300 FOR I=1 TO I4
1310 READ D4$(I),N4(I)
1320 NEXT I
1330 DATA THEN,1,NEXT,1,MID$,2,SWAP,1,READ,1,OPEN,1,LINE,6,CHR$,2,ELSE,1
1340 DATA CINT,2,CSNG,2,CDBL,2,HEX$,2,KILL,1,LSET,1,NAME,1,NULL,1,OCT$,2
1350 DATA PEEK,2,POKE,2,RSET,2,SAVE,1,STR$,2,WAIT,1,LOAD,1
1360 REM - 5-DIGIT COMMANDS
1370 I5=12
1380 FOR I=1 TO I5
1390 READ D5$(I),N5(I)
1400 NEXT I
1410 DATA PRINT,1,INSTR,2,LEFT$,2,INPUT,1,CLEAR,1,DEFFN,1,ERASE,1,ERROR,1
1420 DATA FIELD,2,MERGE,1,WIDTH,1,USING,1
1430 REM - 6-DIGIT COMMANDS
1440 I6=8
1450 FOR I=1 TO I6
1460 READ D6$(I),N6(I)
1470 NEXT I
1480 DATA RIGHT$,2,DEFINT,1,DEFDBL,1,DEFSNG,1,DEFSTR,1,DEFUSR,1,SPACE$,2
1490 DATA VARPTR,2
1500 PRINT "   ": PRINT "   "
1510 F$="": INPUT "NAME OF FILE IS ";F$
1520 IF LEN(F$)=0 THEN STOP
1530 IF RIGHT$(F$,4)<>".BAS" THEN F$=F$+".BAS"
1540 ON ERROR GOTO 1580
1550 OPEN "I",#1,F$
1560 ON ERROR GOTO 0
1570 GOTO 1600
1580 PRINT "COULD NOT FIND: ";F$
1590 ON ERROR GOTO 0:GOTO 1250
1600 NL=0: NV=0: LN=0: NN=0: D1=0: D2=0
1610 PRINT "   ": PRINT "   ": PRINT "   "
1620 PRINT "PHASE 1: DETERMINING PROGRAM VARIABLES"
1630 PRINT TAB(9);"PROCESSING PROGRAM LINE NUMBER:": PRINT "   "
1640 IF EOF(1) THEN GOTO 3410
1650 NL=NL+1: LINE INPUT #1,L$
1660 LL=LEN(L$): I1=1
1670 REM - ELIMINATE BLANKS
1680 S$="": IL=0
1690 SKIP=0
1700 FOR I=1 TO LL
1710 C$=MID$(L$,I,1)
1720 IF NOT SKIP GOTO 1750
1730 IF C$=CHR$(34) THEN SKIP=0
1740 GOTO 1790
1750 IF C$<>CHR$(34) GOTO 1770
1760 SKIP=-1: GOTO 1790
1770 IF C$=" " GOTO 1790
1780 IL=IL+1: S$=S$+C$
1790 NEXT I
1800 LL=IL: L$=S$
1810 REM - GET A STATEMENT
1820 S$="": IF I1>=LL GOTO 1640
1830 I=I1
1840 C$=MID$(L$,I,1)
1850 IF C$=":" THEN GOTO 1880
1860 S$=S$+C$
1870 I=I+1: IF I<=IL GOTO 1840
1880 LS=LEN(S$): I1=I1+LS+1
1890 REM - HAVE A STATEMENT, SEE IF THERE IS A LINE NUMBER
1900 J=0: I=0
1910 J=J+1: C$=MID$(S$,J,1): AC=ASC(C$)
1920 IF AC>47 AND AC<58 GOTO 1970
1930 REM - NOT A DIGIT
1940 IF J=1 THEN GOTO 2020
1950 GOTO 1990
1960 REM - ADD A DIGIT TO THE NUMBER
1970 I=10*I+VAL(C$)
1980 GOTO 1910
1990 REM - HAVE ALL THE DIGITS IN THE NUMBER
2000 LN=I: NN=NN+1: IF NN>8 THEN NN=1: PRINT "   "
```

Similarly, if any type-definition statements (such as DEFINT or DEFSTR) were encountered during Phase 1, these statements are decoded in lines 4570–5270 of the program during Phase 4.

Finally, after all four phases of the program are complete, lines 3650–4090 print a table of the variables, their type, dimension and line references.

While you're running Document, there are some things you should watch out for.

- A lot of memory (about 8Kb) is consumed by the arrays V$, NR, R, C, T$ and SZ, which store the descriptions of the variables and their references. To keep program size reasonable, limits have to be placed on the number of variables and the number of references per variable that can be stored. The present limits allow up to 100 variables and up to 25 references for each variable.

  It takes a pretty large program to exceed these limits, but it is possible. For example, if you use the variable I as the index in all your For-Next loops, just eight loops can easily give you 25 references to I. If you exceed the 100/25 limits, Document prints a message identifying the problem, and continues.

  You have two choices at this point. You can accept the fact that the analysis of your program misses a few variables or a few line references, or you can increase the dimensions of the arrays and rerun Document. If you increase array dimensions, be sure to change the limits in the If statements on lines 3160 and 3350.

- Basic has a problem when you want to print a quotes character (") as part of a string because quotes are used to identify the beginning and the end of the string. Some versions of Basic let you use the special combination of three quotes (""") to identify a quote that is to be printed. If your program makes use of this triple-quote feature, Document ignores any characters in the line to the right of the triple-quote.

- Most keywords in MBasic cannot be used in variable names. For example, SIN is a keyword, so you cannot have a variable name that includes these three characters in this order. XSIN7 is an illegal variable name, but there are one or two keywords that MBasic will allow to be used in variable names. For example, MBasic allows you to rename disk files with the statement NAME F1$ AS F2$. Name is a keyword that cannot be used as part of

More

Now NRI takes you inside the new TRS-80 Model 4 microcomputer with disk drive to train you at home as the new breed of computer specialist!



NRI teams up with Radio Shack advanced technology to teach you how to use, program and service state-of-the-art microcomputers...

It's no longer enough to be just a programmer or a technician. With microcomputers moving into the fabric of our lives (over 1 million of the TRS-80™ alone have been sold), interdisciplinary skills are demanded. And NRI can prepare you with the first course of its kind, covering the complete world of the microcomputer.

Learn At Home In Your Spare Time

With NRI training, the programmer gains practical knowledge of hardware to design simpler, more effective programs. And, with advanced programming skills, the technician can test and debug systems quickly and easily.

Only NRI gives you both kinds of training with the convenience of learning at home. No classroom pressure, no night school, no gasoline wasted. You learn at your convenience, at your own pace. Yet you're always backed by the NRI staff and your instructor, answering questions and giving you guidance.



Now training includes either the TRS-80 Model 4 Microcomputer with Disk Drive or TRS-80 Color Computer with Computer Access Card; professional LCD multimeter; the NRI Discovery Lab; and hundreds of demonstrations and experiments.
(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

TRS-80, Model 4 plus Disk Drive to Learn on and Keep

NRI training is hands-on training with practical experiments and demonstrations. You not only learn to program your computer, you learn all about it...how circuits interact...interface with other systems ...gain a real insight into its nature. Under NRI's carefully planned training, you even install a disk drive, verifying at each step its operation.

You also work with a professional 4-function, 3½ digit digital multimeter and the NRI Discovery Lab,® performing over 60 separate experiments. Both microcomputer and equipment come as part of your training for you to use and keep.

Same Training Available With Color Computer

NRI offers you the opportunity to train with the TRS-80 Color Computer as an alternative to the Model 4. The same technique for getting inside is enhanced by using the new NRI-developed Computer Access Card. Only NRI offers you a choice to fit your specific training needs.

The Catalog is Free. The Training is Priceless.

Get all the details on this exciting course in NRI's free, 104 page catalog. It shows all equipment, lesson outlines, and facts on other electronics courses such as Electronic Design, Industrial Electronics, Video/Audio Servicing...12 different career opportunities in all.

Keep up with the latest technology as you learn on the latest model of the world's most popular computer. If coupon has been used, write to NRI Schools, 3939 Wisconsin Avenue, Washington, D.C. 20016.



NRI McGraw-Hill

NRI Schools
McGraw-Hill Continuing Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016
We'll give you tomorrow.

All career courses approved under GI bill.
☐ Check for details

172-024

The catalog is free.
The training is priceless.

Please check for one free catalog only.

- ☐ Computer Electronics including Microcomputers
- ☐ Color TV, Audio, and Video System Servicing
- ☐ Electronics Design Technology
- ☐ Digital Electronics
- ☐ Communications Electronics • FCC Licenses • Mobile CB • Aircraft • Marine
- ☐ Industrial Electronics
- ☐ Basic Electronics
- ☐ Small Engine Servicing
- ☐ Appliance Servicing
- ☐ Automotive Servicing
- ☐ Auto Air Conditioning
- ☐ Air Conditioning, Heating, Refrigeration, & Solar Technology
- ☐ Building Construction

Name (Please Print) Age

Street

City/State/Zip

Accredited by the Accrediting Commission of the National Home Study Council

Listing continued.

```
2010 TB=5+7*(NN-1): PRINT TAB(TB);LN;
2020 REM - NOW BEGIN TO DECODE THE STATEMENT
2030 W$="": J=J-1: LW=LEN(W$)
2040 J=J+1: IF J<=LS GOTO 2060
2050 IF LW>0 GOTO 2920 ELSE GOTO 1810
2060 C$=MID$(S$,J,1): AC=ASC(C$)
2070 IF LW>0 GOTO 2110
2080 IF AC<48 OR AC>57 GOTO 2110
2090 REM - CHARACTER IS A NUMBER
2100 J=J+1: IF J<=LS GOTO 2060 ELSE GOTO 1810
2110 REM - MAKE SURE CHARACTER IS NOT A DELIMITER
2120 I=1
2130 IF AC<>D(I) GOTO 2150
2140 IF LW>0 GOTO 2920 ELSE GOTO 2040
2150 I=I+1: IF I<=15 GOTO 2130
2160 W$=W$+C$: LW=LEN(W$)
2170 IF LW>7 GOTO 2040
2180 ON LW GOTO 2190,2220,2290,2450,2590,2700,2870
2190 REM - CHECK FOR A CONSTANT 'TYPE' SYMBOL
2200 IF (W$<>"%") AND (W$<>"!") AND (W$<>"#") GOTO 2040
2210 J=J+1: GOTO 2030
2220 REM - CHECK FOR 2 DIGIT COMMANDS
2230 I=1
2240 IF W$<>D2$(I) GOTO 2270
2250 Q2(I)=Q2(I)+1
2260 J=J+N2(I): GOTO 2030
2270 I=I+1: IF I<=I2 GOTO 2240
2280 GOTO 2040
2290 REM - CHECK FOR 3 DIGIT COMMANDS
2300 IF W$<>"DIM" GOTO 2330
2310 IF DI=25 GOTO 2330
2320 DI=DI+1: DI(DI)=NL
2330 IF W$="END" GOTO 1810
2340 IF W$="ERL" GOTO 1810
2350 IF W$="ERR" GOTO 1810
2360 IF W$="NEW" GOTO 1810
2370 IF W$="REM" GOTO 1640
2380 IF W$="RUN" GOTO 1810
2390 I=1
2400 IF W$<>D3$(I) GOTO 2430
2410 Q3(I)=Q3(I)+1
2420 J=J+N3(I): GOTO 2030
2430 I=I+1: IF I<=I3 GOTO 2400
2440 GOTO 2040
2450 REM - CHECK FOR 4 DIGIT COMMANDS
2460 IF W$="CONT" GOTO 1810
2470 IF W$="DATA" GOTO 1640
2480 IF W$="EDIT" GOTO 1810
2490 IF W$="GOTO" GOTO 1810
2500 IF W$="LIST" GOTO 1810
2510 IF W$="STOP" GOTO 1810
2520 IF W$="TRON" GOTO 1810
2530 I=1
2540 IF W$<>D4$(I) GOTO 2570
2550 Q4(I)=Q4(I)+1
2560 J=J+N4(I): GOTO 2030
2570 I=I+1: IF I<=I4 GOTO 2540
2580 GOTO 2040
2590 REM - CHECK FOR 5 DIGIT COMMANDS
2600 IF W$="CLOSE" GOTO 1810
2610 IF W$="GOSUB" GOTO 1810
2620 IF W$="RESET" GOTO 1810
2630 IF W$="TROFF" GOTO 1810
2640 I=1
2650 IF W$<>D5$(I) GOTO 2680
2660 Q5(I)=Q5(I)+1
2670 J=J+N5(I): GOTO 2030
2680 I=I+1: IF I<=I5 GOTO 2650
2690 GOTO 2040
2700 REM - CHECK FOR 6 DIGIT COMMANDS
2710 IF W$="DELETE" GOTO 1810
2720 IF W$="RESUME" GOTO 1810
2730 IF W$="RETURN" GOTO 1810
2740 IF W$="SYSTEM" GOTO 1810
2750 I=1
2760 IF W$<>D6$(I) GOTO 2850
2770 Q6(I)=Q6(I)+1
2780 IF I>4 GOTO 2840
2790 IF D2=25 GOTO 2840
2800 D2=D2+1: DV(D2)=NL
2810 IF D2=1 GOTO 2940
2820 IF DV(D2)<>DV(D2-1) GOTO 2840
2830 D2=D2-1
2840 J=J+N6(I): GOTO 2030
2850 I=I+1: IF I<=I6 GOTO 2760
2860 GOTO 2040
2870 REM - CHECK FOR 7 DIGIT COMMANDS
2880 IF W$="RESTORE" GOTO 1810
2890 IF W$<>"STRING$" GOTO 2910
2900 J=J+2: GOTO 2030
2910 GOTO 2040
2920 REM - HAVE WHAT LOOKS LIKE A VARIABLE, MAKE SURE
2930 REM - TO LOOK FOR EMBEDDED KEY WORDS
2940 L1=LEN(W$): IF LW<=2 GOTO 3140
2950 IF LW>5 GOTO 2970
2960 ON LW-1 GOTO 3110,3020,2980,2970
2970 KW$="GOSUB": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
2980 KW$="THEN": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
2990 KW$="GOTO": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3000 KW$="ELSE": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3010 KW$="STEP": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3020 KW$="AND": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
```

More

a variable name, but As is not. Thus, the name Trash is a legitimate name for a variable in MBasic. If you happen to use the Name-As statement in your program, Document does not pick up the reference to the second variable properly.

- You cannot have more than five subscripts in a DIM statement. Thus, DIM X(1,2,3,4,5) is acceptable, but DIM X(1,2,3,4,5,6) is not. If this is a problem, you can increase the dimension of DG in line 1060 from five to any reasonable number.
- Document cannot handle more than 25 lines containing DIM statements or 25 lines containing DEFSTR, DEFINT, DEFDBL or DEFSNG statements. Again, these limits can be increased by increasing the dimensions of the variables DI and DV in lines 1060 and 1080.

Customizing Document

Converting Document to run under other Basic interpreters is straightforward. You will probably have to make minor changes in string-handling functions, such as MID$ and LEFT$, since these frequently vary from version to version of Basic. Then, too, if your Basic has different keywords than MBasic, you'll want to change the Data statements in lines 1130–1490 and the If statements in lines 2330–2740 and 2970–3120 to reflect the keywords your version of Basic uses. This is done in two ways:

1. Keywords that can be followed by variable names are stored in the Data statements, followed by a number, where the number is one more than the number of characters you want to skip after the keyword.

It isn't really that complicated. As an example, the keyword SIN can be followed by a variable name, as in Y=SIN(X), so this should appear in a Data statement rather than an If statement. Also, after the keyword SIN, you want to skip one character, the parenthesis; consequently, you would enter this keyword as DATA SIN,2.

2. Keywords that cannot be followed by variable names are entered in If statements. For example, the keyword REM cannot be followed by a variable name (since everything on the line to the right of REM is ignored), so it's entered in an If statement in line 2370. The keywords used by MBasic are common to almost all Basics so you'll actually have to make only minor changes, if any at all.

The statements used to open, close and read from the disk file may have

to be changed. For example, running Document under Heath's BH Basic would require that the file opening statement on line 1550 be changed from OPEN "I",#1,F$ to OPEN F$ FOR READ AS FILE #1.

One of the nice things about MBasic is the speed with which it handles string functions. Since most of the running time of Document is spent in manipulating strings, your running time may increase with different versions of Basic. If you use BH Basic, you can expect running times to at least double.

Run-Time Optimization

While Document spends a lot of time processing strings and adding and removing characters, it also spends a lot of time running through loops looking for statement delimiters and keywords.

You can reduce running time if you arrange the order of searches so that a keyword is found on the first pass through a loop rather than on the 25th pass. The problem here is that different types of programs use Basic keywords with different frequencies.

A word processing program might use string functions like LEFT$, MID$ and RIGHT$ often, while a scientific program might use few string functions but many mathematical functions (SQR, SIN, ABS and so forth). Document checks for keywords in an order that is efficient for analysis of string-processing programs.

If your programs make little use of string functions, you can reduce Document's running time by changing the order of the keywords in the Data statements. This is why Document gives you the option of having a frequency-of-usage table printed out for your program. By using this table, you can optimize Document's Data statements for your applications.

While this will take care of the keywords, you will still want to optimize the order of the Basic statement delimiters in the Data statement of line 1130. To do this, you can use a separate Basic program, similar to that shown in Listing 4, to scan your program(s) and give you a frequency-of-usage table for the various ASCII codes. This particular example tells us that for a scientific program, such as that shown in Listing 1, you can optimize Document's running time by checking first for an equal sign, second for a comma, third for a quote and so forth.

Memory Size Optimization

If you decide that checking for array dimensions and variable types is not essential, you can reduce memory requirements by about 2Kb by deleting program lines 3600–3640 and 4150–5270. This eliminates Phases 3 and 4 of the program. Document still checks for variables that are typed by a type-declaration character (a dollar sign, a pound sign, an exclamation mark or a percent sign), but not check for global type-definition statement, (DEFSTR, DEFDBL, DEFINT or DEFSNG).

About 8Kb is required for the arrays used to store information about the variables. As mentioned before, by reducing the maximum number of variables (currently set at 100) or the number of references per variable (currently set at 25) that Document can handle, the arrays can be redimensioned and a significant amount of memory made available.

Document is a utility that no MBasic programmer should be without. It will help you to better document your own programs and better understand programs written by someone else.■

You can obtain a copy of Document by sending $10 and a ten-sectored (hard) 5¼-inch floppy disk to Stephen Auyer, 65 Pollock Ave., Pittsfield, MA 01201. Unless you specify otherwise, the disk will be reinitialized under HDOS 2.0 and will contain copies of Document and several test cases.

Listing continued.

```
3030 KW$="INP": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3040 KW$="IMP": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3050 KW$="EQV": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3060 KW$="XOR": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3070 KW$="MOD": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3080 KW$="INT": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3090 KW$="SIN": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3100 KW$="PUT": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3110 KW$="TO": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3120 KW$="OR": J1=INSTR(W$,KW$): IF J1>0 THEN GOSUB 4100
3130 IF LEN(W$)<=0 GOTO 2030
3140 REM - MUST BE A VARIABLE, SEE IF THIS IS THE FIRST ONE
3150 J=J+1: IF NV>0 GOTO 3260
3160 IF NV<100 GOTO 3190
3170 PRINT: PRINT "NO SPACE FOR VARIABLE: ";W$
3180 GOTO 2030
3190 NV=NV+1
3200 V$(NV)=W$: NR(NV)=1: R(1,NV)=LN: C(NV)=NV: SZ(NV)=1
3210 T$(NV)="SNG": RC$=RIGHT$(W$,1)
3220 IF RC$="$" THEN T$(NV)="STR"
3230 IF RC$="%" THEN T$(NV)="INT"
3240 IF RC$="#" THEN T$(NV)="DBL"
3250 GOTO 2030
3260 REM - SEE IF PREVIOUSLY FOUND
3270 I=1
3280 IF W$<>V$(I) GOTO 3390
3290 IF NR(I)=0 GOTO 3350
3300 M=1
3310 IF R(M,I)<>LN GOTO 3340
3320 REM - NO NEED TO STORE THIS REFERENCE
3330 GOTO 2030
3340 M=M+1: IF M<=NR(I) GOTO 3310
3350 IF NR(I)<25 GOTO 3380
3360 PRINT: PRINT "TOO MANY REFERENCES FOR VARIABLE: ";W$
3370 GOTO 2030
3380 NR(I)=NR(I)+1: R(NR(I),I)=LN: GOTO 2030
3390 I=I+1: IF I<=NV GOTO 3280
3400 GOTO 3160
3410 REM - HAVE COMPLETED SCAN OF PROGRAM
3420 CLOSE #1
3430 PRINT: PRINT "   ": PRINT "   "
3440 PRINT "PHASE 2: SORTING VARIABLES"
3450 M=NV: M2=M
3460 M=INT(M/2): IF M=0 GOTO 3590
3470 M=M OR 1: J=M+1
3480 L=J
3490 I=L-M
3500 IF V$(I)<=V$(L) GOTO 3570
3510 SWAP V$(I),V$(L)
3520 SWAP NR(I),NR(L)
3530 SWAP C(I),C(L)
3540 SWAP T$(I),T$(L)
3550 IF I<=M GOTO 3570
3560 L=I: GOTO 3490
3570 IF J=M2 GOTO 3460
3580 J=J+1: GOTO 3480
3590 REM - END OF SORT, VARIABLES NOW IN ALPHABETICAL ORDER
3600 REM - THE FOLLOWING TWO CALLS MAY BE ELIMINATED TO SAVE SPACE
3610 REM - GET DIMENSIONS OF ARRAYS
3620 GOSUB 4150
3630 REM - GET VARIABLE TYPES
3640 GOSUB 4570
3650 PRINT "   ": PRINT "   ": PRINT "   "
3660 PRINT "  VARIABLE     TYPE     SIZE     LINE REFERENCES"
3670 PRINT "  --------     ---      ----     ---------------"
3680 PRINT "   "
3690 FOR I=1 TO NV
```

More →

Listing continued.

```
3700 PRINT "  ";V$(I);TAB(15);T$(I);TAB(23);SZ(I);
3710 J=C(I)
3720 L1=1
3730 N=0: L2=L1+5: IF L2>NR(I) THEN L2=NR(I)
3740 FOR L=L1 TO L2
3750 M=32+7*N: N=N+1
3760 PRINT TAB(M);R(L,J);
3770 NEXT L: PRINT
3780 L1=L2+1
3790 IF L1<=NR(I) GOTO 3730
3800 NEXT I
3810 PRINT "   ": PRINT "   ": PRINT "   "
3820 INPUT "DO YOU WANT A FREQUENCY OF USEAGE TABLE ";C$
3830 IF LEFT$(C$,1)<>"Y" GOTO 4070
3840 PRINT "   ": PRINT "   "
3850 PRINT "          KEY WORD    USEAGE"
3860 PRINT "          --------    ------": PRINT "   "
3870 FOR I=1 TO I2
3880 IF Q2(I)=0 GOTO 3900
3890 PRINT TAB(10);D2$(I);TAB(20);Q2(I)
3900 NEXT I
3910 FOR I=1 TO I3
3920 IF Q3(I)=0 GOTO 3940
3930 PRINT TAB(10);D3$(I);TAB(20);Q3(I)
3940 NEXT I
3950 FOR I=1 TO I4
3960 IF Q4(I)=0 GOTO 3980
3970 PRINT TAB(10);D4$(I);TAB(20);Q4(I)
3980 NEXT I
3990 FOR I=1 TO I5
4000 IF Q5(I)=0 GOTO 4020
4010 PRINT TAB(10);D5$(I);TAB(20);Q5(I)
4020 NEXT I
4030 FOR I=1 TO I6
4040 IF Q6(I)=0 GOTO 4060
4050 PRINT TAB(10);D6$(I);TAB(20);Q6(I)
4060 NEXT I
4070 PRINT "   ": PRINT "   ": PRINT "   "
4080 PRINT "END OF PROGRAM"
4090 STOP
4100 REM - ROUTINE TO EXTRACT A PORTION OF A STRING
4110 LW=LEN(W$)
4120 W$=LEFT$(W$,J1-1)
4130 J=J-LW+J1-1+LEN(KW$)
4140 RETURN
4150 REM - ROUTINE TO DETERMINE ARRAY DIMENSIONS
4160 IF D1<=0 THEN RETURN
4170 PRINT "   ": PRINT "   ": PRINT "   "
4180 PRINT "PHASE 3: DETERMINING ARRAY DIMENSIONS"
4190 OPEN "I",#1,F$
4200 I=1: J=0
4210 LINE INPUT #1,L$
4220 J=J+1: IF J<>D1(I) GOTO 4210
4230 I=I+1: LW=LEN(L$): S$=""
4240 FOR K=1 TO LW
4250 C$=MID$(L$,K,1): IF C$=" " GOTO 4270
4260 S$=S$+C$
4270 NEXT K
4280 K1=INSTR(S$,"DIM")+3: K2=LEN(S$)
4290 W$=""
4300 K=K1
4310 C$=MID$(S$,K,1)
4320 IF C$="(" GOTO 4350
4330 W$=W$+C$: K3=K+2
4340 K=K+1: IF K<=K2 GOTO 4310
4350 L=1
4360 DG(L)=0
4370 K=K3
4380 C$=MID$(S$,K,1)
4390 IF (C$=",") OR (C$=")") GOTO 4420
4400 DG(L)=10*DG(L)+VAL(C$): K4=K+2
4410 K=K+1: IF K<=K2 GOTO 4380
4420 IF C$=")" GOTO 4440
4430 K3=K4: L=L+1: GOTO 4360
4440 K4=K4+1: DT=DG(1): IF L=1 GOTO 4480
4450 FOR K=2 TO L
4460 DT=DT*DG(K)
4470 NEXT K
4480 K=1
4490 IF V$(K)<>W$ GOTO 4510
4500 SZ(K)=DT: GOTO 4530
4510 K=K+1: IF K<=NV GOTO 4490
4520 PRINT "PROGRAM ERROR, W$= ";W$
4530 IF K4>=K2 GOTO 4550
4540 K1=K4: GOTO 4290
4550 IF I>D1 THEN CLOSE #1: RETURN
4560 GOTO 4210
4570 REM - ROUTINE TO DETERMINE VARIABLE TYPES
4580 IF D2=0 THEN RETURN
4590 PRINT "   ": PRINT "   ": PRINT "   "
4600 PRINT "PHASE 4: DETERMINING VARIABLE TYPES"
4610 OPEN "I",#1,F$
4620 I=1: J=0
4630 LINE INPUT #1,L$
4640 J=J+1: IF J<>DV(I) GOTO 4630
4650 I=I+1: LW=LEN(L$): S$=""
4660 FOR K=1 TO LW
4670 C$=MID$(L$,K,1): IF C$=" " GOTO 4690
4680 S$=S$+C$
4690 NEXT K
4700 N1=1: LS=LEN(S$)
4710 FOR N=1 TO 4
4720 JJ(N)=INSTR(S$,D6$(N)): J$(N)=RIGHT$(D6$(N),3)
4730 NEXT N
4740 FOR JI=1 TO 4
4750 FOR K=2 TO 4
4760 IF JJ(K)>JJ(K-1) GOTO 4780
4770 SWAP JJ(K),JJ(K-1): SWAP J$(K),J$(K-1)
4780 NEXT K
4790 NEXT JI
4800 IF JJ(N1)>0 GOTO 4840
4810 N1=N1+1: IF N1<=4 GOTO 4800
4820 IF I<=D2 GOTO 4630
4830 GOTO 5270
4840 J1=JJ(N1)+6
4850 TV$=J$(N1)
4860 N1=N1+1
4870 W1$=""
4880 K=J1
4890 C$=MID$(S$,K,1): K1=K
4900 IF (C$=",") OR (C$=":") GOTO 4940
4910 IF C$="-" GOTO 5080
4920 W1$=W1$+C$
4930 K=K+1: IF K<=LS GOTO 4890
4940 REM - SINGLE CHARACTER
4950 LW=LEN(W1$)
4960 FOR L=1 TO NV
4970 IF LEFT$(V$(L),LW)<>W1$ GOTO 5010
4980 RC$=RIGHT$(V$(L),1)
4990 IF (RC$="$") OR (RC$="%") OR (RC$="#") OR (RC$="!") GOTO 5010
5000 T$(L)=TV$
5010 NEXT L
5020 IF (K1>=LS) AND (I<=D2) GOTO 4630
5030 IF K1>=LS GOTO 5270
5040 IF C$="," THEN J1=K1+1: GOTO 4870
5050 IF N1<=4 GOTO 4800
5060 IF I<=D2 GOTO 4630
5070 GOTO 5270
5080 REM - RANGE OF CHARACTERS
5090 W2$=""
5100 K=K1+1
5110 C$=MID$(S$,K,1): K2=K
5120 IF (C$=",") OR (C$=":") GOTO 5150
5130 W2$=W2$+C$
```

More

Listing 3 continued.

```
5140 K=K+1: IF K<=LS GOTO 5110
5150 L1=LEN(W1$): L2=LEN(W2$)
5160 FOR L=1 TO NV
5170 IF LEFT$(V$(L),L1)<W1$ GOTO 5220
5180 IF LEFT$(V$(L),L2)>W2$ GOTO 5220
5190 RC$=RIGHT$(V$(L),1)
5200 IF (RC$="$") OR (RC$="%") OR (RC$="#") OR (RC$="!") GOTO 5220
5210 T$(L)=TV$
5220 NEXT L
5230 IF (K2>=LS) AND (I<=D2) GOTO 4630
5240 IF K1>=LS GOTO 5270
5250 IF C$="," THEN J1=K2+1: GOTO 4870
5260 IF N1<=4 GOTO 4800
5270 CLOSE #1: RETURN
5280 END
```

Listing 4. This program scans your files to determine distribution of various ASCII codes.

```
1000 REM - PROGRAM TO SCAN FILE TO DETERMINE DISTRIBUTION OF
1010 REM - VARIOUS ASCII CODES
1020 CLEAR 1000
1030 DEFINT A-Z
1040 DIM A(128),C(128)
1050 FOR I=1 TO 128
1060 C(I)=I-1
1070 A(I)=0
1080 NEXT I
1090 INPUT "FILE NAME IS ";F$
1100 OPEN "I",#1,F$
1110 LINE INPUT #1,L$
1120 LL=LEN(L$)
1130 FOR I=1 TO LL
1140 C$=MID$(L$,I,1)
1150 J=ASC(C$)+1
1160 A(J)=A(J)+1
1170 NEXT I
1180 IF NOT EOF(1) GOTO 1110
1190 CLOSE #1
1200 REM - FILE SCAN COMPLETE, NOW SORT CODES
1210 FOR I=1 TO 128
1220 NS=0
1230 FOR J=2 TO 128
1240 IF A(J)<=A(J-1) GOTO 1280
1250 NS=NS+1
1260 SWAP A(J),A(J-1)
1270 SWAP C(J),C(J-1)
1280 NEXT J
1290 IF NS=0 GOTO 1310
1300 NEXT I
1310 PRINT " ": PRINT " "
1320 PRINT "     ASCII     CHARACTER     NUMBER OF"
1330 PRINT "      CODE                   OCCURRENCES"
1340 PRINT "     -----     ---------     -----------"
1350 F$="   "    ######       \   \         ####"
1360 PRINT "   "
1370 FOR I=1 TO 128
1380 IF A(I)=0 GOTO 1420
1390 PRINT USING F$;C(I),CHR$(C(I)),A(I)
1400 NEXT I
1410 PRINT "   ": PRINT "   ": PRINT "   "
1420 END
```

```
RUN
FILE NAME IS ? DETERM.BAS

     ASCII      CHARACTER      NUMBER OF
      CODE                   OCCURRENCES
     -----      ---------      -----------
        32                        133
        49          1              74
        48          0              72
        84          T              60
        73          I              46
        78          N              45
        69          E              40
        79          O              35
        65          A              32
        82          R              32
        61          =              20
        76          L              20
        68          D              19
        77          M              19
        44          ,              18
        88          X              18
        50          2              17
        34          "              16
        40          (              16
        41          )              16
        51          3              16
        70          F              16
        45          -              14
        83          S              14
        74          J              13
        80          P              11
        52          4               8
        85          U               8
        67          C               6
        71          G               6
        75          K               6
        53          5               5
        55          7               5
        57          9               5
        36          $               4
        43          +               4
        54          6               4
        56          8               4
        59          ;               4
        60          <               3
        42          *               2
        46          .               2
        62          >               2
        66          B               2
        72          H               2
        87          W               2
        47          /               1
        58          :               1
        89          Y               1
```

Smarter Than the Average Atari

The author's objective in making his Atari 400 an intelligent graphics interface was to keep it simple and keep it cheap. In the first of a two-part series, he explains his methods in using the Atari as an intelligent peripheral.

By Brian and Christine Ence

Shortly after I finished building my Heathkit H89, I decided that I wanted a graphics interface, but I didn't have the $400 to buy one. So when I was given the opportunity to buy a second-hand Atari 400, a friend jokingly said, "Why don't you buy that for your graphics interface?" I did.

An Intelligent Peripheral

Now I have an intelligent graphics peripheral with up to 320×192 pixels resolution, 12 different graphics modes, a four-voice sound generator, two eight-bit parallel I/O ports and more—all programmable in Basic. I can program it to respond not only to simple plot and draw-to commands but also to turtle graphics commands like Forward 20 steps, Left 15 degrees, and Pen up/down.

My interface can be connected to any computer through an RS-232C serial port, and it can be duplicated for about $150.

It consists of an Atari 400 with 16Kb of memory, a Basic programming cartridge and a simple circuit that can be built for less than $40. No hardware modification of the Atari is required.

Above and Beyond Graphics

The Atari 400's price isn't the only thing that makes it a bargain. The system has many capabilities beyond just graphics. This article gives you the information you need to use the Atari 400 as an intelligent peripheral for many applications. If you'd like to improve the graphics capabilities of your computer and give it added functions, this may be the solution for you.

The first half of this article describes the Atari serial port, explains the interface hardware and gives details on the programs that allow the host computer to save and load Atari programs. The second half will first present information on programming the Atari Pokey chip for serial I/O and interrupt handling in the Atari; second, describe one method of communication between the host computer and the Atari; and third, provide the software to let you use the Atari as a simple graphics peripheral. I will also suggest other possible uses of the Atari as an intelligent interface.

Cheap and Simple

When I started this project I set two guidelines for myself. In order of importance they were: keep it cheap and keep it simple.

I felt that I had two basic problems to solve: how to save Atari programs and how to establish two-way communication between my H89 and my Atari. If I could solve these problems, I assumed the rest would be easy (as it turned out, I was right!).

The simplest way to save Atari programs is to use the Atari cassette recorder. But the $75 price tag violated my first guideline. I also have an aversion to using a cassette recorder when there is a disk drive right beside it.

Still, the built-in cassette Save and Load commands do provide some cheap and simple software to store programs.

I decided to use my H89 to emulate the Atari cassette recorder. This leads to an initialization procedure that lasts several minutes each time I want to use graphics. Considering the cost and simplicity of the approach, however, I was willing to pay that price.

I began this project by trying to find out all I could about how the Atari recorder worked. I soon found that while data was stored as tones generated by the computer (5327 Hz for a 1 and 3995 Hz for a 0), these tones were decoded to high- and low-level signals by the recorder at playback time.

This meant that an interface between my computers would only have to decode the tones coming from the Atari. It wouldn't have to recreate these tones for feeding the data back to the Atari. (Score one for "Keep it simple.") I also found that the data was sent to the recorder at 600 bits per second (bps).

After building a tone decoder and doing a little experimentation, I recognized the data format used. Data in each file is stored in 132-byte records that include two synchronization characters, a command byte, 128 data bytes and a checksum. Each byte is sent as ten bits: one start bit, eight data bits, no parity bit and one stop bit.

I was now in a position to write a program for the H89 to save Atari programs, but I still needed some direct communication between computers. The joystick ports provide means for a parallel input or output of data, but my H89 doesn't have a parallel port. Adding such a port would have added cost and probably complexity to the project.

At this point I broke down and bought the Atari *Technical Reference Notes*. Studying this information, I

Address correspondence to Brian and Christine Ence, 1015 East Main St., Lansdale, PA 19446.

realized that, with a little modification, my interface for the cassette emulator could also serve as a serial interface for the communication path that I was trying to make.

The Atari serial port is used to connect all peripherals, including the cassette recorder. (See the sidebar titled "Atari Serial Port Connector.") When more than one peripheral is used, they are connected, one to the next, in a daisy chain.

Data is sent to the recorder as tones with the motor output high. When data is to be sent to any other peripheral, it is sent as high and low voltages; the motor output is low and other signal lines are used for control.

I decided to use these other control lines to regulate communication between the computers and to use the motor output to select between the cassette emulator mode of the interface and a direct transmission of data.

Keeping Out of the Code

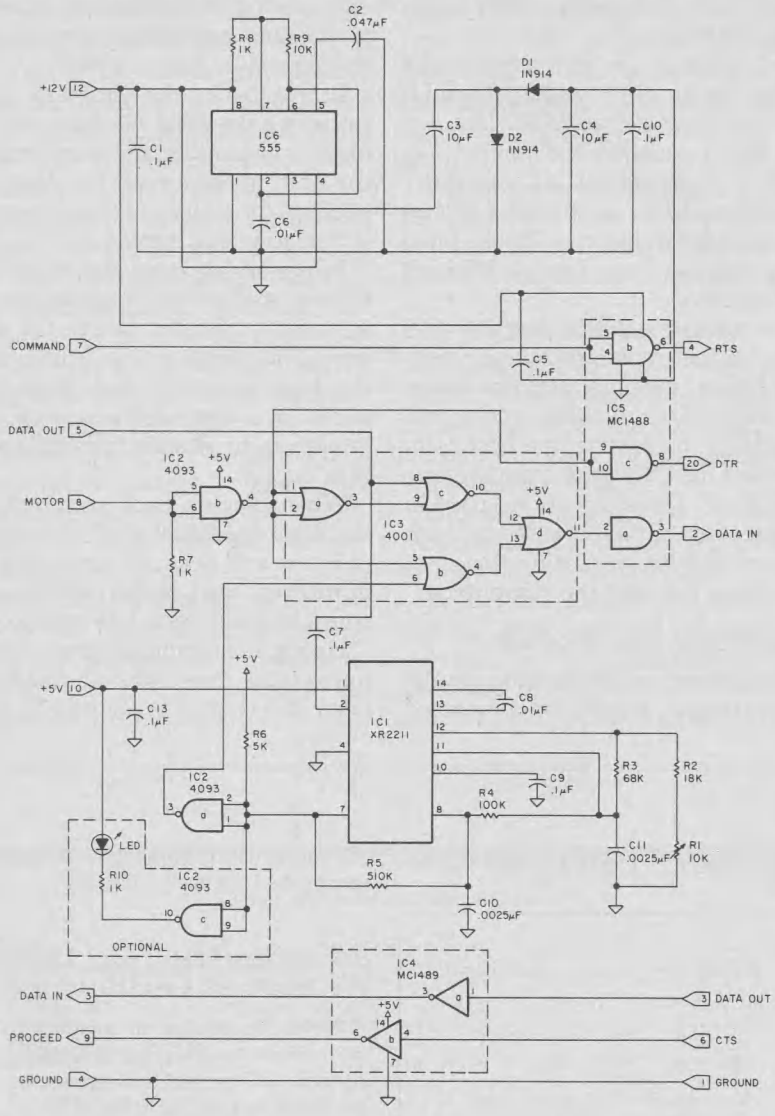
Both the Heath and the Atari software provide good device-independent means for I/O. I chose to bypass these routines in both computers in order to avoid writing a lot of code.

This decision sacrifices the I/O flexibility provided by the operating systems of these computers, but that is the price of "Keep it simple." The communication routines I wrote directly address the I/O hardware.

My routines for the H89 are designed for use with the INS8250 asynchronous communications IC, which controls my serial port. You'll have to study your serial I/O system to adapt these routines to your computer.

The rest of this article gives details on the interface circuit and the cassette emulator program.

Part 2 will describe communication between the computers and give an example of how the Atari is used as a graphics interface. I will also discuss some ideas on how you can extend the use of the Atari for other functions.



Atari serial port to RS-232C interface decodes two-tone data (intended for cassette recorder) while directly passing normal data. Pin numbers for the plug on the left are for the Atari serial port. On the right, the pin numbers are for an RS-232C male connector for connecting the interface as DC Equipment (in other words, it should plug into a line-printer port). In constructing the circuit, good wiring practices should be observed throughout, with special attention given to IC6. This IC tends to generate a lot of noise, so keep it relatively isolated from the rest of the circuit. Use short wires and mount C1 as close as possible to IC6, and C5 as close as possible to IC5. The optional parts, R10 and the LED, are required only if you intend to adjust R1 without an oscilloscope. Atari serial connector can be purchased as part # APX-90003 from APX, PO Box 427, 155 Moffett Park Drive, Sunnyvale, CA 94086, for $9.95 plus shipping and handling.

Required Hardware

The circuit I am using is shown in the figure above. It performs three functions: converts signal levels, supplies negative voltage for the level conversion and decodes tones.

Looking at the circuit in more detail, you'll see that IC5 and IC4 convert TTL-level signals to RS-232C levels and back, respectively.

IC6 generates the negative supply voltage necessary for IC5 by generating a square wave which is then rectified by D1 and D2 and filtered by C3 and C4.

IC1 is the tone decoder for the cassette data. The output of IC1 is inverted by IC2 to give proper polarity to the decoded signal and is then sent as one data input to IC3. IC3 is wired as one of two data selectors.

The motor command output of the Atari is buffered by IC2 and is used as the control input of the data selector. Data from the Atari is sent directly to the data selector and to the tone decoder.

When the motor command is high (that is, when the data from the Atari is sent as tones), it causes data coming from the tone decoder to be selected for transmission.

When the motor command is low, data is not tone encoded and is sent by the data selector directly to the output.

The only adjustment that this circuit needs is R1, which sets the center frequency of the tone decoder. This is most easily done by connecting a jumper between pins 2 and 10 of IC1.

With no input at pin 2, observe the

signal at pin 3 with either a frequency counter or an oscilloscope with a calibrated time base.

Then adjust R1 to give a frequency of 4601 Hz (in other words, the midpoint between 3995 and 5327 Hz).

To finish, remove the jumper between pins 2 and 10. (If you don't have access to an oscilloscope or frequency counter, see the sidebar titled "Adjusting the Tone Decode Without an Oscilloscope.")

You will notice that besides providing for the transmission and reception of data, the interface also transmits the command signal and motor signal from the Atari to the host computer, and the CTS signal from the host to the Atari. These signals are used in the operation of the cassette emulator program and for regulating the communication between the computers.

Cassette Emulator Program

The software for the cassette emulator program is simple. In the record mode, the program needs to accept data, store it in a temporary buffer until the Atari has finished sending a file and then store it on the disk.

In playback, the program should retrieve a specified file from the disk, place it in a buffer and then send it to the Atari in the format the Atari is expecting. Of course nothing is ever as simple as it first appears.

When saving from the Atari (using CSave), a glitch can occur in the leader tone that is sent before the actual data. This glitch will look like data to the host computer and must be ignored. You also need a way of knowing when the Atari is finished sending data.

When playing back recorded data, the Atari expects at least nine seconds of leader and does not accept any data during that wait. It also expects a short pause between each 132-byte record.

Listing 1 is a short program that performs these record and playback functions. It is written in HForth-79, which is a variation of Forth.

HForth-79 follows the Forth-79 standard with a number of extensions that take advantage of the H89 features. See the sidebar titled "HForth-79 Extensions in Recorder Emulator Program."

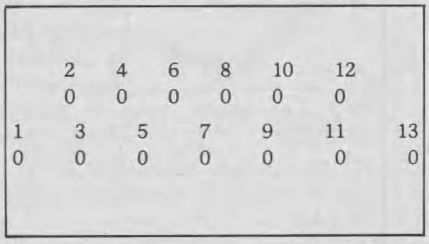
Go Forth to Other Languages

Because of the structured nature of Forth, this program should be a useful guide to those who would like to write a similar program in another language. Those unfamiliar with Forth should see the sidebar titled "Reading a Forth Program."

In my recorder emulator program, the highest-level words are Record and Playback, which are defined in screens 4 and 5, respectively.

They both begin by initializing the port (Init.Port), setting up a buffer area (Set.Buffer) for storing data going to or coming from the Atari and then getting the name of the file to be used for storing data on the disk (Get

Atari Serial Port Connector



1. Clock in: used as a clock at the data rate when transmit or receive rates are set by an external clock.
2. Clock out: clock signal at the data rate for transmitted data.
3. Data into computer: TTL input levels.
4. Ground.
5. Data out of computer: TTL output levels.
6. Ground.
7. Command: normally high; when low, it signals peripherals to interpret the following data as a command.
8. Motor control: turns on cassette recorder motor.
9. Proceed: logic input not currently used by Atari, normally pulled high.
10. +5/Ready: indicates that the computer is ready and may be used as a +5 volt, 50 mA power source.
11. Audio in: audio from the second track of the cassette recorder may be input here for playing over the TV.
12. +12: A +12-volt supply of unknown current rating.
13. Interrupt: a logic input not currently used by Atari, normally pulled high.

Adjusting the Tone Decoder Without an Oscilloscope

R1 can be adjusted to approximately the correct value by observing the intensity of the optional LED in the following manner. Enter the following program in the Atari:

```
10?"UUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUU"
20?"UUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUUUUUUUUUUUUUUU"
```

and continue for approximately ten more identical lines. (There are 113 Us in each line.)

With the interface plugged into the serial port, type CSAVE, press return and observe the LED.

Once the Atari begins sending data, begin adjusting R1. You should find that with R1 at one limit of its range the LED will be off and at the other limit the LED will be at its full brightness.

Over some portion of this range the brightness will be somewhat dimmer. Set R1 to the middle of this dimmer range and the adjustment is complete.

HForth-79 Extensions in Recorder Emulator Program

MAXBUF—leaves on the stack the maximum number of 1024-byte buffers available.
FIRST—a fig-Forth standard word, leaves the address of the buffer lowest in memory.
P!, P@—fig-Forth, like ! and @ but for use with Z80 or 8080 ports.
SCALL—calls Heath DOS system calls. The calls used are described in the comments to the words that use this word.
MS—delay approximately n milliseconds where n is the top number on the stack.
BS—leave the ASCII character for backspace on the stack.
→—continue loading on the following screen.
;S—stop loading of a screen.

Reading a Forth Program

Forth is not a common language and at first glance a Forth program may seem difficult to understand. With an explanation of some of the basic Forth programming rules, however, you should be able to follow the operation of a Forth program.

The following paragraphs won't teach you how to use Forth, but they should help you use the Forth listings in this article to write your own programs.

Some of the basic concepts of Forth that you will need to understand are: the structured style of the coding process; the use of "screens"; the rules for naming Forth words and variables; the methods for transferring data between routines; and the use of post-fix notation.

.File.Name).

Record continues with Get.Data and Store, and ends by displaying "CSave completed." The real work in Record is done by Get.Data which clears the buffer, ignores any glitch and then accepts data.

It ignores any glitch that may occur by waiting for the first synchronization character of the first record before accepting data. Once it has begun accepting data and storing it in the buffer, it checks to see if the motor command is still high by checking the state of the DTR line.

When the motor command goes low, Get.Data is exited. Store is then entered.

Store determines the number of records sent, stores that number in the first two bytes of the buffer and stores the data in the buffer on disk.

After the first three words (Init.Port, Set.Buffer, Get.File.Name), Playback continues with Disk.To.Buffer and Buffer.To.Atari.

Disk.To.Buffer transfers the file from the disk to the buffer. Buffer .To.Atari fetches the data in the first two bytes of the buffer and displays this as the number of records to be sent. It pauses 12 seconds and sends the file with a 350-millisecond pause after each record (132 bytes).

Playback also displays a number of messages on the screen to let you know how the load is progressing.

The portions of this program that you may have to adapt to your computer are Init.Port, Read.Port (used in Record) and Write.port (used in Playback). Your Init.Port routine must set the data rate to 600 bps and the data format to eight data bits, no parity bit and one stop bit.

Read.Port waits until the Receive-Data-Ready flag is set and then reads the Receive-Buffer register. Write.Port waits for the Transmitter-Holding-Register-Empty flag to be set and then writes the next byte to be sent to the Transmitter-Holding register.

To save an Atari program, type CSAVE at the Atari and hit return, type RECORD at the host computer, type the file name for the program, hit return again on the Atari and wait for the Atari to finish sending the program.

To load a previously stored program back into the Atari, follow the same sequence using CLoad at the Atari and Playback at the host computer.

Part 2: Control Your Atari

Up to this point I have described the circuitry and programming necessary to turn a sophisticated computer into a cassette recorder for an inexpensive Atari—not too exciting.

But everything is now in place to turn the tables and really put the Atari to work as an intelligent peripheral.

In part 2, I'll show you how I control the Atari with my computer and give you enough information to expand and modify the ideas I will present for your application.■

From Top to Bottom

The structured style of Forth requires that a program be designed from the top down and coded from the bottom up. This means that a task to be programmed is broken into subtasks, which in turn are broken into sub-subtasks until the tasks are of a size that can be coded in Forth.

The coding process in Forth consists of defining words. A definition consists of a colon, the name of the word being defined, its definition and a semicolon.

Forth standard words are used to define the lowest-level tasks (words). These new words are then used to define the next level of tasks or words.

The process of defining increasingly higher-level words continues until the last word defined is the application program.

One way to read a Forth program, then, is to start at the end, where the highest-level words are defined. Then look back in the program to find the definition of words that define the highest-level words. Continue looking back until you have learned the definitions of all the words.

Definitions are stored in blocks of memory, consisting of 1024 bytes, called screens. Forth uses the disk for virtual memory. This requires that portions of memory be swapped with data on the disk when that data is requested.

This swapping is done one screen at a time. The size of a screen is convenient for the swapping process. Its contents are typically displayed on a terminal screen as 16 lines of 64 characters each.

A screen may be used to store either data or

Listing 1. Recorder emulator program.

```
SCR # 1
  0 \ RECORDER EMULATOR, DISK FILE HANDLING WORDS          014SEP83BME
  1 : STOP ;
  2 VARIABLE DBLOCK 4 ALLOT DBLOCK !" SYOATR"
  3 VARIABLE NAME 16 ALLOT VARIABLE BUFF.SIZE
  4 VARIABLE FBUFFER VARIABLE FILE.SIZE
  5 : OPENW  NAME DBLOCK 0 1 1 35 SCALL DROP ;       \ OPEN FOR WRITE
  6 : OPENR NAME DBLOCK 0 1 1 34 SCALL DROP ;        \ OPEN FOR READ
  7 : READF 0 FBUFFER @ BUFF.SIZE @ 1 1 4 SCALL DROP ;   \ READ FILE
  8 : WRITEF 0 FBUFFER @ FILE.SIZE @ 1 1 5 SCALL DROP ;  \ WRITE FIL
  9 : CLOSEF 0 0 0 1 1 38 SCALL DROP ;               \ CLOSE FILE
 10 -->
 11
 12
 13
 14
 15

SCR # 2
  0 \ RECORDER EMULATOR, INIT.PORT READ.PORT WRITE.PORT    06AUG83BME
  1 208 CONSTANT PORT 192 CONSTANT LSD 0 CONSTANT MSD
  2 : INIT.PORT   0 PORT 3 + P! 0 PORT 1 + P!   \ DISABLE INTERRUPTS
  3     16 PORT 4 + P!                          \ SET LOOP BACK
  4     128 PORT 3 + P! LSD PORT P! MSD PORT 1 + P! \ SET BAUD
  5     3 PORT 3 + P!                          \ 8 BITS,NOPAR,1STOP
  6     PORT P@ DROP                            \ READ ONCE
  7     34 MS PORT P@ DROP                       \ WAIT READ AGAIN
  8     0 PORT 4 + P! ;                         \ CLEAR LOOP BACK
  9 : READ.PORT   BEGIN PORT 5 + P@ 1 AND UNTIL PORT P@ ;
 10 : WRITE.PORT   BEGIN PORT 5 + P@ 32 AND UNTIL PORT P! ;
 11 -->
 12
 13
 14
 15

SCR # 3
  0 \ RECORDER EMULATOR, GET.DATA
  1 VARIABLE BYTES  \ TO STORE # OF BYTES ACTUALLY USED
  2 : SET.BUFFER   MAXBUF BUFFERS CR
  3         MAXBUF 1024 * BUFF.SIZE !
  4         ." Buffer size =" MAXBUF . ." K Bytes" CR
  5         FIRST FBUFFER ! ;
  6 : CLEAR.BUFFER  FBUFFER @ BUFF.SIZE @ ERASE ;
  7 : DEGLITCH  BEGIN READ.PORT 85 = UNTIL   \ IGNORE EVERYTHING
  8         85 FBUFFER @ 2 + C! ;            \ UNTIL SYNC CHAR.
  9 : CHECK.MOTOR  PORT 6 + P@ 32 AND ;      \ SEE IF MOTOR IS ON
```

More →

Listing continued

```
 10 : GET.DATA  CLEAR.BUFFER DEGLITCH
 11          BUFF.SIZE @ 3 DO CHECK.MOTOR
 12          IF READ.PORT FBUFFER @ I + C!
 13          ELSE LEAVE
 14          THEN I BYTES ! LOOP ;
 15 -->

SCR # 4
  0 \ RECORDER EMULATOR, GET.NAME RECORD
  1 : GET.FILE.NAME  NAME 17 ERASE
  2          ." File Name? " NAME 16 EXPECT CR ;
  3 : COMPUTE.FILES   BYTES @ 256 / 1+ 256 * FILE.SIZE ! ;
  4 : STORE   BYTES @ BUFF.SIZE @ = IF ." BUFFER FULL" ELSE
  5          BYTES @ 132 / FBUFFER @ !        \ COMPUTE # OF REC.'S
  6          COMPUTE.FILES
  7          OPENW WRITEF CLOSEF THEN ;
  8 : RECORD   INIT.PORT SET.BUFFER
  9          GET.FILE.NAME GET.DATA STORE
 10          ." Csave completed" CR ;
 11 -->
 12
 13
 14
 15

SCR # 5
  0 \ RECORDER EMULATOR, PLAYBACK
  1 VARIABLE SEG#  VARIABLE SEG.ADDR
  2 : DISK.IO.BUFFER   OPENR READF CLOSEF ;
  3 : SEND.SEG   SEG# @ 132 * FBUFFER @ + 2 + SEG.ADDR !
  4          132 0 DO I SEG.ADDR @ + C@  WRITE.PORT  LOOP  ;
  5 : BUFFER.IO.ATARI   FBUFFER @ @ . ." Records to send" CR
  6          ." Pause " 12000 MS CR ." Sending record      "
  7          FBUFFER @ @ 0 DO I SEG# !
  8          BS EMIT BS EMIT BS EMIT BS EMIT I 1+ 4 .R
  9          SEND.SEG 350 MS LOOP CR ;
 10 : PLAYBACK   INIT.PORT SET.BUFFER
 11          GET.FILE.NAME DISK.IO.BUFFER BUFFER.IO.ATARI ;
 12 ;S
 13
 14
 15
```


Circle 185 on Reader Service card.

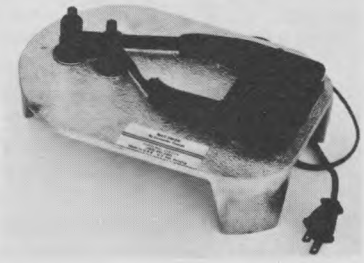
Re-ink any fabric ribbon for less than 5¢. Extremely simple operation. We have a MAC INKER for any printer. Lubricant ink safe for dot matrix printheads. Multi-colored inks, uninked cartridges available. Ask for brochure. Thousands of satisfied customers.

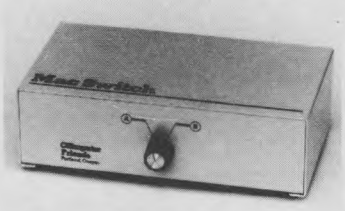
$54.95 +

Mac Switch lets you share your computer with any two peripherals (serial or parallel). Ideal for word processors—never type an address twice. Ask us for brochure with tips on how to share two peripherals with MAC SWITCH. Total satisfaction or full refund.

$99.00

CALL TOLL FREE 800-547-3303





Mac Inker & MacSwitch

Computer Friends
100 N.W. 86th Ave.
Portland, OR 97229
503/297-2321

programs. When a program is stored in a screen, the first line of the screen is used as an index of important words defined in that screen. This is done with the Forth word \ (backslash), which is like the Basic statement REM.

Names used for Forth words may be up to 31 characters, but must have no spaces in them. Sometimes, in order to enhance the readability of a name, a phrase may be used. In that case, the spaces between the words may be taken up with periods to observe the no spaces rule.

Names of variables follow the same rule. Variables may be created by using the Forth words variable, constant, array and so on. For example, Variable FBuffer creates a variable named FBuffer. Allot is used to extend the amount of storage space assigned to a variable, usually to permit storing character strings.

Another key concept to understanding Forth is the stack. Data may be transferred between words in either the conventional manner with variables or through the stack.

The stack is a last-in, first-out buffer. When a number is typed at the terminal or encountered during execution of a Forth word, it is pushed onto the top of the stack, moving anything else on it down.

The next word which requires an input pulls from the stack the top number or numbers until it has all the data it needs. Likewise, a word may leave behind a number to be used by another word. Writing a Forth program often involves careful manipulation of the data on the stack.

Sometimes it is unreasonable to pass data on the stack. In those cases, data can be stored to and fetched from named variables using the words ! and @ respectively. For example, if FBuffer were previously defined as a variable then n FBuffer ! would store the number, n, in FBuffer, or FBuffer @ would leave on the stack the value contained in FBuffer.

Post-fix notation or Reverse Polish Notation (RPN) is a prominent characteristic of Forth. Thus MAXBUF 1024 * BUFF.SIZE ! multiplies the number left on the stack by MAXBUF by 1024 and stores the result in BUFF.SIZE.

This method of notation is reflected in other Forth words, for example, 132 0 DO ----- LOOP causes the words between Do and Loop to be executed 132 times. Here 132 is the loop limit and zero is the beginning value of the index. Conditional statements are also written in this form.

Thus FBuffer @ 0= IF ---- ELSE ---- THEN fetches the value in FBuffer. If this value is equal to zero, the words between IF and ELSE are executed, otherwise the words between ELSE and THEN are executed. (The ELSE portion is optional.)

It's Only Logical

This is a cursory overview of Forth, but it should help you to follow the logic of the programs I have listed in this article.

CONCORD COMPUTER PRODUCTS

2910 'B' E. La Palma
Anaheim, Ca. 92806
(714) 632-6790

send $1.00 for catalog

VISA MC
10. MIN ORDER / CA. RES. ADD 6%
CHECK-M O
ALLOW 2 WKS. DEL'Y. IF PERSONAL CHECK IS SENT.

Freight:
$10 - 49 → $2.00
50 - 99 → 4.00
100 - 240 → 8.00
$250 - 499 → $9.00
500 - 999 → 11.00
1000 - UP → Call

Store Hours:
Weekdays 10 to 6pm.
Saturday 10 to 3 pm.

MONITORS

SYNCO # TM1200A
12in. 18MHz. Amber Phos.
$110.00

TAXAN # KG-12N
12in. 18 MHz. / GREEN Phos.
Non-Glare Screen $ 135.00

TAXAN # KG-12NUY
12in. 18 MHz. / AMBER Phos.
Non-Glare Screen $ 145.00

BMC # BM-12EUN
12in. 20MHz. GREEN Phos.
Non-Glare !! $114.00

System I

- Apple Compatible
- 128k RAM
- Key Pad
- Upper / lower case
- 80 column
- 6502 / Z80 Processors

$825.00

Diskette SALE!!

"Wabash"

	5¼	8inch
SS/SD soft	$17.50	$21.00
2 ten paks for	15.00 ea.	18.00 ea.
SS/DD	23.00	28.00
DS/DD	31.00	35.00

[QTY. PRICE AVAIL.]

Authorized Wabash Dist.

Disk Storage Boxes

	5¼"	8"
SRW	$2.50ea 5/10.00 (Holds 10)	$3.50ea 5/15.00
FLIP'N' FILE	$19.95ea (Holds 50)	$23.95ea

Super5 "HALF-HIGH"
- Apple compat. Drive

$218.00

SYSTEM SAVER For APPLE

- Power AC Filter
- Mounts Outside

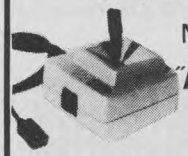
$65.95

POWER SUPPLY "for APPLE"

5v → 5.0A
12v → 2.0A
-5v → 500ma
-12v → 500ma

$79.50

JOYSTICK



MIDASONIC: Stick
"APPLE" $19.95

IC MASTER

2 Vols
$19.95 ('82)
$39.95 ('83)

COMPONENTS ☆ prices subject to change ☆

74LS

74LS00	.48	74LS55	.25	74LS139	.75	74LS194	.95				
74LS02	.45	74LS73	.38	74LS145	1.95	74LS195	.95	74LS299	2.25		
74LS03	.35	74LS74	1.55	74LS147	2.10	74LS196	.95	74LS323	4.75		
74LS04	.55	74LS75	.45	74LS148	2.75	74LS197	.95	74LS352	1.25		
74LS05	.48	74LS76	.45	74LS151	.55	74LS221	1.10	74LS353	1.25		
74LS08	.35	74LS83	.55	74LS153	.70	74LS240	1.65	74LS365	.65		
74LS09	.32	74LS85	.95	74LS154	1.90	74LS241	1.75	74LS366	.65		
74LS10	.42	74LS86	.75	74LS155	.75	74LS242	1.75	74LS367	.95		
74LS11	.35	74LS90	.65	74LS156	.75	74LS243	1.75	74LS368	.95		
74LS12	.35	74LS93	.65	74LS157	.65	74LS244	1.75	74LS373	1.95		
74LS13	.45	74LS95	.95	74LS158	.65	74LS245	1.85	74LS374	1.95		
74LS14	.90	74LS96	.89	74LS160	.85	74LS247	1.10	74LS375	.85		
74LS20	.28	74LS107	.45	74LS161	.85	74LS248	1.10	74LS377	1.25		
74LS21	.28	74LS109	.45	74LS162	.85	74LS249	1.10	74LS378	1.25		
74LS22	.28	74LS112	.55	74LS163	.85	74LS251	.65	74LS379	1.25		
74LS26	.28	74LS113	.45	74LS164	.85	74LS253	.85	74LS386	.75		
74LS27	.28	74LS122	.55	74LS165	.95	74LS257	.65	74LS390	1.45		
74LS28	.35	74LS123	1.85	74LS166	1.75	74LS258	.95	74LS393	1.35		
74LS30	.24	74LS125	.75	74LS168	1.75	74LS259	1.75	74LS395	1.20		
74LS32	.42	74LS126	.55	74LS169	1.75	74LS260	.75	74LS399	1.40		
74LS33	.50	74LS132	.70	74LS170	1.55	74LS266	.85	74LS490	1.90		
74LS37	.35	74LS133	.70	74LS173	.65	74LS273	1.55	74LS623	1.90		
74LS38	.48	74LS136	.55	74LS174	.85	74LS279	.55	74LS668	1.65		
74LS42	.55	74LS137	.95	74LS175	.85	74LS280	1.95	74LS669	1.80		
74LS48	.75	74LS138	.95	74LS181	1.95	74LS283	.95	74LS670	1.45		
74LS49	.75			74LS190	1.10	74LS290	.95	74LS683	3.95		
74LS51	.24			74LS191	1.10	74LS293	.85	74LS685	3.95		
74LS54	.25			74LS192	.95	74LS295	.95	74LS687	4.50		
				74LS193	.95	74LS298	.85	74LS783	15.95		

74S

74S00	.38	74S32	.40					74S280	1.85
74S02	.35	74S37	.85	74S138	.85	74S194	1.35	74S287	1.85
74S03	.30	74S38	.85	74S140	.60	74S195	1.35	74S288	1.85
74S04	.45	74S50	.25	74S151	.95	74S201	6.50	74S289	6.75
74S05	.35	74S51	.25	74S157	.95	74S240	2.25	74S299	6.75
74S06	.30	74S64	.40	74S158	.95	74S241	2.25	74S373	2.45
74S09	.35	74S65	.40	74S161	1.85	74S244	2.75	74S374	2.45
74S10	.35	74S74	1.95	74S163	3.75	74S251	.85	74S387	1.90
74S11	.35	74S85	1.75	74S174	.95	74S253	.85	74S454	4.50
74S15	.35	74S86	1.85	74S175	.95	74S257	.85	74S470	6.50
74S20	.35	74S112	.50	74S182	2.50	74S258	.85	74S471	9.50
74S22	.35	74S124	2.50	74S188	1.85	74S260	.95	74S472	9.50
74S30	.30	74S132	1.10	74S189	5.95	74S275	15.85	74S474	9.50

CMOS

CD4001	.30	CD4024	.65	CD4049	.55	CD4402	.85		
CD4006	1.05	CD4025	.35	CD4050	.55	CD4404	1.55		
CD4007	.35	CD4028	.95	CD4051	.79	CD4411	11.25		
CD4008	.95	CD4029	.89	CD4052	.85	CD4412	.85		
CD4011	.30	CD4030	.35	CD4053	.75	CD4415	2.50		
CD4012	.30	CD4031	1.75	CD4056	1.05	CD4416	.85		
CD4013	.38	CD4035	1.25	CD4060	1.05	CC4428	.85		
CD4014	.75	CD4037	1.25	CD4066	.95	CD4501	.55		
CD4015	.95	CD4038	1.75	CD4071	.40	CD4511	1.35		
CD4016	.38	CD4040	1.15	CD4075	.45	CD4512	1.25		
CD4017	.95	CD4041	.95	CD4078	.45	CD4516	1.55		
CD4018	.95	CD4043	.75	CD4081	.45	CD4517	1.05		
CD4019	.65	CD4044	.95	CD4093	.95	CD4518	1.20		
CD4020	.95	CD4046	.85	CD4098	1.85	CD4519	.85		
CD4023	.35	CD4047	.95	CD4174	1.60	CD4520	1.25		

RAMS

2016-200NS	5.95	2102	.85	2114L-2	1.85	4116-150NS	8/14.95
2101	1.95	2111	2.95	4027	1.75	4164-200NS	5.95
				4116-200NS	8/12.95		

4164-150NS	7.95		
5290	1.75		
6116-200NS	7.25		
6116-150NS	7.95		
5101-600NS	4.50		

EPROMS

1702	3.95	2716	3.95	2532	6.95	2732	4.75	2764	8.75
2708	3.95							2764-3	11.50
4708	3.55								

8000

8038	2.55	8155	7.75	8212	2.95	8251A	4.75	8279	8.50
8080A	3.75	8202	24.50	8214	6.50	8255	5.75	8748-8	22.50
8085A	7.75			8224	1.95				

Z80

Z80CPU	3.85	Z80PIO	4.95	Z80ACPU	5.95	Z80APIO	4.95	Z80SIO	15.50
Z80CTC	6.25	Z80SIO/2	14.95	Z80ACTC	6.85				

6500-6800

6402	6.95	6800	3.95	6810	3.95	6845	12.50	6852	5.25
6502	4.95	6802	7.75	6821	3.00	6847	11.95	6860	9.50
6522	6.95	6809	12.50	6840	10.50	6850	3.25		
6532	9.75								

LINEAR

LM300H	.45	LM322	1.55	LM555	.35	LM723	.75	1358	1.35
LM301N	.35	LM323K	4.95	LM556	1.10	LM733	.95	1372	4.95
LM301H	.45	LM324	.65	LM558	2.45	LM741-8	.45	1458	.55
LM307H	.45	LM339	.99	LM565	1.45	LM741N-14	.45	1488	1.10
LM308AN	2.25	LM348	1.25	LM566	1.45	LM741H	.45	1489	1.10
LM309K	1.25	LM358	.65	LM703	.75	LM747	.65	1496	1.10
LM310	1.45	LM380	1.10	LM709	.40	LM775	.25	1889	1.55
LM311N	.50	LM381	1.85	LM710	.75	1330	1.60	4501	1.50
LM311H	.85	LM386	1.40	LM711	.49	1349	1.75	4558	.75
LM317K	3.85	LM351	1.95	LM720	.75	1350	1.15		
LM318H	1.45								

☆ SPECIALS ☆

- ☆2708 $3.25
- ☆2716 $3.85
- ☆2732 $4.65
- ☆4116-2 8/12.95
- ☆4164-2 9/53.00
- ☆6116P3 $7.25

☆ORDER LINE☆

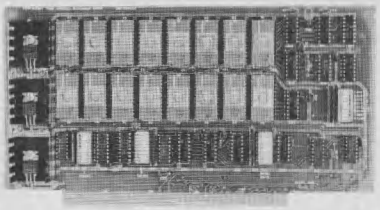
(800) 435-0907
(Outside Calif.)
★Please use for Ordering !!

DIGITAL RESEARCH COMPUTERS

(214) 271-3538

32K S-100 EPROM CARD

PRICE CUT!



$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

64K S100 STATIC RAM

$199.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

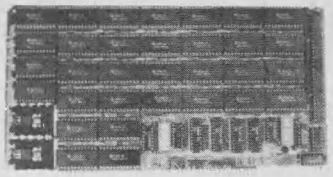
SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $185

ASSEMBLED AND TESTED ADD $50

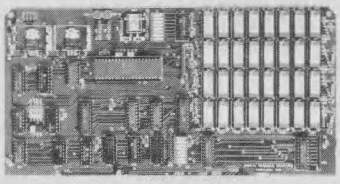


FEATURES:

- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports IEEE 696 24 BIT Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- ★ 2716 EPROMs may be installed in any of top 48K.
- ★ Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- ★ Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- ★ BOARD may be partially populated as 56K.

256K S-100 SOLID STATE DISK SIMULATOR!

WE CALL THIS BOARD THE "LIGHT-SPEED-100" BECAUSE IT OFFERS AN ASTOUNDING INCREASE IN YOUR COMPUTER'S PERFORMANCE WHEN COMPARED TO A MECHANICAL FLOPPY DISK DRIVE.



ADD $50 FOR A & T KIT.

BLANK PCB (WITH CP/M* 2.2 PATCHES ON DISK) $69.95

FEATURES:

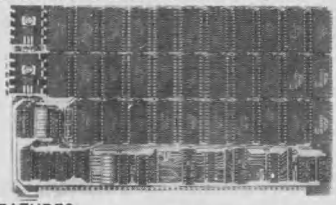
- ★ 256K on board, using + 5V 64K DRAMS.
- ★ Uses new Intel 8203-1 LSI Memory Controller.
- ★ Requires only 4 Dip Switch Selectable I/O Ports.
- ★ Runs on 8080 or Z80 S100 machines.
- ★ Up to 8 LS-100 boards can be run together for 2 Meg. of On Line Solid State Disk Storage.
- ★ Provisions for Battery back-up.
- ★ Software to mate the LS-100 to your CP/M* 2.2 DOS is supplied.
- ★ The LS-100 provides an increase in speed of up to 7 to 10 times on Disk Intensive Software.
- ★ Compare our price! You could pay up to 3 times as much for similar boards.

$399.00

#LS-100 (FULL 256K KIT)

64K SS-50 STATIC RAM

$179.00 (48K KIT)



NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $219

64K Kit $249

ASSEMBLED AND TESTED ADD $50

FEATURES:

- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- ★ 2716 EPROMs may be installed anywhere on Board.
- ★ Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- ★ One Board supports both RAM and EPROM.
- ★ RAM supports 2MHZ operation at no extra charge!
- ★ Board may be partially populated in 16K increments.

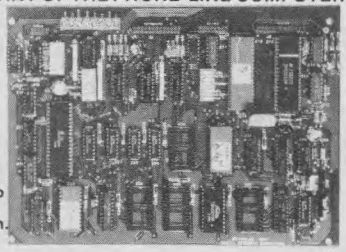
THE NEW ZRT-80

CRT TERMINAL BOARD!

A LOW COST Z-80 BASED SINGLE BOARD THAT ONLY NEEDS AN ASCII KEYBOARD, POWER SUPPLY, AND VIDEO MONITOR TO MAKE A COMPLETE CRT TERMINAL. USE AS A COMPUTER CONSOLE, OR WITH A MODEM FOR USE WITH ANY OF THE PHONE-LINE COMPUTER SERVICES.

FEATURES:

- ★ Uses a Z80A and 6845 CRT Controller for powerful video capabilities.
- ★ RS232 at 16 BAUD Rates from 75 to 19,200.
- ★ 24 x 80 standard format (60 Hz).
- ★ Optional formats from 24 x 80 (50 Hz) to 64 lines x 96 characters (60 Hz).
- ★ Higher density formats require up to 3 additional 2K x 8 6116 RAMS.
- ★ Uses N.S. INS 8250 BAUD Rate Gen. and USART combo IC.
- ★ 3 Terminal Emulation Modes which are Dip Switch selectable. These include the LSI-ADM3A, the Heath H-19, and the Beehive.
- ★ Composite or Split Video.
- ★ Any polarity of video or sync.
- ★ Inverse Video Capability.
- ★ Small Size: 6.5 x 9 inches.



BLANK PCB WITH 2716 CHAR. ROM, 2732 MON. ROM $59.95

SOURCE DISKETTE - ADD $10

SET OF 2 CRYSTALS - ADD $7.50

ADD $50 FOR A & T KIT.

ZRT-80

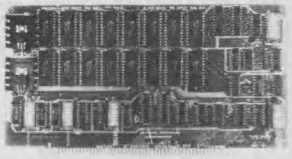
WITH 8 IN. SOURCE DISK! **$129.95** (COMPLETE KIT, 2K VIDEO RAM)

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! **NEW!**

EPROM II FULL EPROM KIT $80.00

A&T EPROM ADD $35.00



BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:

- ★ This one board can be used in any one of four ways:
  - A. As a 32K 2716 EPROM Board
  - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- ★ Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- ★ Fully Supports IEEE 696 Buss Standard (As Proposed)
- ★ Supports 24 Bit Extended Adressing
- ★ 200 NS (FAST!) RAM'S are standard on the RAM Kit
- ★ Supports both Cromemco and North Star Bank Select
- ★ Supports Phantom
- ★ On Board wait State Generator
- ★ Every 2K Block may be disabled
- ★ Addressed as two separate 16K Blocks on any 64K Boundary
- ★ Perfect for MP/M* Systems
- ★ RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $129.95

For RAM Kit A&T - Add $40

TERMS: Add $3.00 postage. We pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

Digital Research Computers

P.O. BOX 461565 • GARLAND, TEXAS 75046 • (214) 271-3538

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

*TM OF DIGITAL RESEARCH INC. (CALIF.)

WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH INC. (CALIF.) THE SUPPLIERS OF CPM SOFTWARE

FEATURES THE POWERFUL, THIRD GENERATION, MOTOROLA 6809 PROCESSOR!

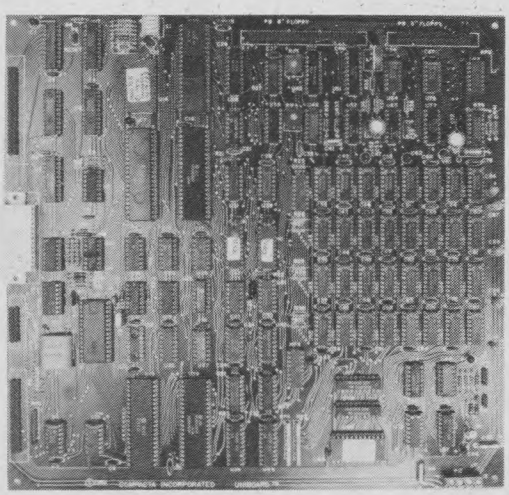
THE 6809 "UNIBOARD"™

SINGLE BOARD COMPUTER KIT

New!

PERFECT FOR COLLEGES, OEM'S, INDUSTRIAL AND SCIENTIFIC USES!

64K RAM! DOUBLE DENSITY FLOPPY DISK CONTROLLER!



BLANK PC BOARD
$99.95
WITH PAL'S, AND TWO EPROMS.

FOR 5-1/4 OR 8 INCH SOURCE DISKETTE ADD $10.

$399.00
COMPLETE KIT! FULLY SOCKETED.

ALL OPTIONS ARE STANDARD. NO EXTRAS TO BUY!

THE COMPACTA UNIBOARD™: Through special arrangement with COMPACTA INC., we are proud to have been selected the exclusive U.S. Mfg. of their new 6809 UNIBOARD™ COMPUTER KIT. Many software professionals feel that the 6809 features probably the most powerful instruction set available today on ANY 8 bit micro. Now, at last, all of that immense computing power is available at a truly unbelievably low price.

FEATURES:

- ★ 64K RAM using 4116 RAMS.
- ★ 6809E Motorola CPU.
- ★ Double Density Floppy Disk Controller for either 5-1/4 or 8 inch drives. Uses WD1793.
- ★ On board 80 x 24 video for a low cost console. Uses 2716 Char. Gen. Programmable Formats. Uses 6845 CRT Controller.
- ★ ASCII keyboard parallel input interface. (6522)
- ★ Serial I/O (6551) for RS232C or 20 MA loop.
- ★ Centronics compatible parallel printer interface. (6522)
- ★ Buss expansion interface with DMA channel. (6844)
- ★ Dual timer for real time clock application.
- ★ Powerful on board system monitor (2732). Features commands such as Go To, Alter, Fill, Move, Display, or Test Memory. Also Read and Write Sectors. Boot Normal, Unknown, and General Flex™.

YOUR CHOICE OF POPULAR DISK OPERATING SYSTEMS:

FLEX™ from TSC	$149
OS9™ from Microware	$199

Specify 5-1/4 or 8 Inch

PC BOARD IS DOUBLE SIDED, PLATED THRU SOLDER MASKED, 11 x 11-1/2 IN.

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A FREE COPY IS AVAILABLE UPON REQUEST.

Digital Research Computers
(OF TEXAS)

P.O. BOX 461565 • GARLAND, TEXAS 75046 • (214) 271-3538

TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order. VISA, MC, cash accepted. Add $4.00 shipping.
USA AND CANADA ONLY

7400

**Number of Pins of each I.C. for easy Socket purchase

Part No.	**Pins	Price
SN7400N	14	.25
SN7401N	14	.25
SN7402N	14	.25
SN7403N	14	.25
SN7404N	14	.25
SN7405N	14	.25
SN7406N	14	.45
SN7407N	14	.29
SN7408N	14	.25
SN7409N	14	.25
SN7410N	14	.25
SN7411N	14	.25
SN7412N	14	.49
SN7413N	14	.39
SN7414N	14	.49
SN7416N	14	.25
SN7417N	14	.25
SN7420N	14	.19
SN7421N	14	.49
SN7422N	14	.49
SN7423N	16	.59
SN7425N	14	.29
SN7426N	14	.29
SN7427N	14	.25
SN7428N	14	.59
SN7430N	14	.25
SN7432N	14	.29
SN7437N	14	.25
SN7438N	14	.29
SN7439N	14	.59
SN7440N	14	.19
SN7441N	16	.89
SN7442N	16	.45
SN7443N	16	1.25
SN7444N	16	1.25
SN7445N	16	.69
SN7446N	16	.69
SN7447N	16	.69
SN7448N	16	.69
SN7450N	14	.19
SN7451N	14	.19
SN7453N	14	.19
SN7454N	14	.19
SN7459N	14	.25
SN7460N	14	.39
SN7470N	14	.29
SN7472N	**14**	**.29**
SN7473N	14	.35
SN7474N	14	.35
SN7475N	16	.45
SN7476N	16	.35
SN7479N	14	4.95
SN7480N	14	.89
SN7482N	14	1.49
SN7483N	16	.59
SN7485N	16	.59
SN7486N	14	.35
SN7489N	16	2.25
SN7490N	14	.39
SN7491N	14	.79
SN7492N	14	.39
SN7493N	14	.39
SN7494N	14	.89
SN7495N	14	.49
SN7496N	16	.49
SN7497N	16	3.25
SN74100N	24	1.95
SN74104N	14	1.19
SN74105N	14	1.19
SN74107N	**14**	**.29**
SN74109N	**16**	**.39**
SN74116N	24	1.49
SN74121N	14	.39
SN74122N	14	.69
SN74123N	16	.49
SN74125N	14	.45
SN74126N	14	.45
SN74132N	14	.49
SN74136N	14	.69
SN74141N	16	.89
SN74142N	16	3.95
SN74143N	24	3.95
SN74144N	24	3.95
SN74145N	16	.59
SN74147N	16	1.49
SN74148N	16	1.19
SN74150N	24	1.19
SN74151N	16	.59
SN74152N	14	.59
SN74153N	16	.59
SN74154N	24	1.25
SN74155N	**16**	**.59**
SN74156N	16	.59
SN74157N	**16**	**.59**
SN74160N	16	.69
SN74161N	16	.69
SN74162N	16	.69
SN74163N	16	.69
SN74164N	14	.69
SN74165N	16	.69
SN74166N	16	.89
SN74167N	16	2.95
SN74170N	16	1.29
SN74172N	24	4.95
SN74173N	16	.69
SN74174N	16	.69
SN74175N	16	.69
SN74176N	14	.69
SN74177N	14	.69
SN74179N	16	1.49
SN74180N	14	.69
SN74181N	24	1.95
SN74182N	16	1.19
SN74184N	16	2.49
SN74185N	16	2.49
SN74190N	16	.69
SN74191N	16	.69
SN74192N	16	.69
SN74193N	16	.69
SN74194N	16	.69
SN74195N	16	.69
SN74196N	14	.89
SN74197N	14	.89
SN74198N	24	1.19
SN74199N	24	1.19
SN74221N	16	1.19
SN74251N	16	.79
SN74276N	20	2.49
SN74279N	16	.79
SN74283N	16	1.49
SN74284N	16	2.95
SN74285N	16	2.95
SN74365N	16	.55
SN74366N	16	.55
SN74367N	16	.55
SN74368N	16	.55
SN74390N	16	1.49
SN74393N	14	1.49

74LS

74LS00	14	.25
74LS01	14	.25
74LS02	14	.29
74LS03	14	.25
74LS04	14	.35
74LS05	14	.29
74LS08	14	.29
74LS09	14	.29
74LS10	14	.29
74LS11	14	.35
74LS12	14	.35
74LS13	14	.39
74LS14	14	.59
74LS15	14	.35
74LS20	14	.29
74LS21	14	.29
74LS22	**14**	**.29**
74LS26	14	.29
74LS27	14	.29
74LS28	14	.35
74LS30	14	.29
74LS32	14	.39
74LS33	14	.55
74LS37	14	.35
74LS38	14	.35
74LS40	14	.29
74LS42	16	.55
74LS47	16	.75
74LS48	16	.75
74LS49	14	.75
74LS51	14	.25
74LS54	14	.25
74LS55	14	.29
74LS73	14	.39
74LS74	14	.49
74LS75	16	.39
74LS76	16	.39
74LS78	14	.39
74LS83	16	.65
74LS85	16	.89
74LS86	14	.39
74LS90	14	.55
74LS92	14	.55
74LS93	14	.55
74LS95	14	.79
74LS96	16	.89
74LS107	14	.39
74LS109	16	.39
74LS112	16	.39
74LS113	14	.39
74LS114	14	.39
74LS122	14	.49
74LS123	16	.89
74LS125	14	.59
74LS126	14	.49
74LS132	14	.59
74LS133	16	.59
74LS136	14	.39
74LS138	16	.89
74LS139	16	.79
74LS151	16	.59
74LS153	16	.59
74LS154	24	1.29
74LS155	16	.69
74LS156	16	.69
74LS157	16	.69
74LS158	16	.59
74LS160	16	.69
74LS161	16	.69
74LS162	16	.69
74LS163	16	.69
74LS164	14	.69
74LS165	16	1.19
74LS168	16	1.19
74LS169	16	1.19
74LS170	16	1.49
74LS173	16	.69
74LS174	16	.69
74LS175	16	.69
74LS181	24	2.95
74LS190	16	.89
74LS191	16	.89
74LS192	16	.79
74LS193	16	.79
74LS194	16	.69
74LS195	16	.69
74LS197	14	.79
74LS221	16	.89
74LS240	20	1.09
74LS241	20	1.09
74LS242	14	1.09
74LS243	14	1.09
74LS244	20	1.49
74LS245	20	1.49
74LS247	16	1.09
74LS248	16	1.09
74LS249	16	1.09
74LS251	16	.59
74LS253	16	.59
74LS257	16	.59
74LS258	16	.59
74LS260	14	.59
74LS266	14	.69
74LS273	20	1.49
74LS279	16	.49
74LS283	16	.69
74LS290	14	.89
74LS293	14	.79
74LS298	16	.89
74LS352	16	1.29
74LS353	16	1.29
74LS365	16	.49
74LS366	16	.49
74LS367	16	.49
74LS368	16	.49
74LS373	20	1.49
74LS374	20	1.49
74LS375	16	.69
74LS386	14	.45
74LS393	14	1.19
74LS399	16	1.49
74LS670	16	1.49
81LS95	20	1.49
81LS97	20	1.49

74S/PROMS*

74S00	14	.35
74S02	14	.35
74S03	14	.35
74S04	14	.45
74S05	14	.45
74S08	14	.39
74S09	14	.39
74S10	14	.35
74S11	14	.35
74S15	14	.35
74S20	14	.35
74S22	14	.35
74S30	14	.35
74S32	14	.45
74S38	14	.89
74S40	14	.39
74S51	14	.35
74S64	14	.39
74S65	14	.39
74S74	14	.55
74S85	16	2.49
74S86	14	.55
74S112	16	.55
74S113	14	.55
74S114	14	.55
74S133	16	.45
74S134	16	.50
74S135	16	.69
74S136	14	1.39
74S138	16	.89
74S139	16	.89
74S140	14	.55
74S151	16	.99
74S153	16	.99
74S157	16	.99
74S158	16	.99
74S160	16	2.49
74S174	16	1.19
74S175	16	1.19
74S188*	16	1.49
74S194	16	1.49
74S195	16	1.49
74S196	14	1.49
74S240	20	2.25
74S241	20	2.25
74S242	14	2.49
74S243	14	2.49
74S244	20	2.49
74S251	16	1.19
74S253	16	1.19
74S257	16	1.19
74S258	16	1.19
74S260	14	1.19
74S280	14	1.95
74S287*	16	1.95
74S288*	16	1.95
74S373	20	2.49
74S374	20	2.49
74S387*	16	1.95
74S471*	20	5.95
74S472*	20	4.95
74S473*	20	4.95
74S474*	24	4.95
74S475*	24	4.95
74S570*	16	2.95
74S571*	16	2.95
74S572*	18	4.95
74S573*	18	4.95
74S940	20	2.49
74S941	20	2.49

CA—LINEAR

CA3010H		1.35
CA3039H		1.35
CA3046N	14	1.35
CA3059N	14	2.95
CA3060N	16	2.95
CA3065E	14	1.49
CA3080E	8	.89
CA3081N	16	.99
CA3082N	16	1.19
CA3083N	16	1.49
CA3086N	14	.69
CA3089N	16	1.69
CA3096N	16	1.49
CA3130E	8	.89
CA3140E	8	.79
CA3160H		1.95
CA3161E	16	2.95
CA3162E	16	6.95
CA3189E	16	1.59
CA3401N	14	.59

CD—CMOS

CD4000	14	.29
CD4001	14	.29
CD4002	14	.29
CD4006	14	1.19
CD4007	14	.29
CD4009	16	.59
CD4010	16	.59
CD4011	14	.29
CD4012	14	.29
CD4013	14	.39
CD4014	16	1.19
CD4015	16	.39
CD4016	14	.49
CD4017	16	1.19
CD4018	16	.99
CD4019	16	.59
CD4020	16	1.19
CD4021	16	1.19
CD4022	16	1.19
CD4023	14	.29
CD4024	14	.69
CD4025	14	.23
CD4026	16	2.49
CD4027	16	.45
CD4028	16	.69
CD4029	16	1.29
CD4030	14	.39
CD4034	24	2.49
CD4035	16	1.49
CD4040	16	1.19
CD4041	14	1.19
CD4042	16	.89
CD4043	16	.79
CD4044	16	.79
CD4046	16	1.19
CD4047	14	1.29
CD4048	16	.59
CD4049	16	.39
CD4050	16	.39
CD4051	16	.99
CD4052	16	.99
CD4053	16	.99
CD4056	16	2.95
CD4059	24	7.95
CD4060	16	1.49
CD4066	14	.59
CD4068	14	.39
CD4069	14	.29
CD4070	14	.39
CD4071	14	.29
CD4072	14	.29
CD4073	14	.29
CD4075	14	.29
CD4076	16	1.19
CD4078	14	.49
CD4081	14	.29
CD4082	14	.29
CD4093	14	.49
CD4098	16	1.95
CD4506	16	1.19
CD4507	14	1.19
CD4508	24	3.95
CD4510	16	1.29
CD4511	16	1.19
CD4512	16	1.19
CD4514	24	2.49
CD4515	24	2.49
CD4516	16	1.19
CD4518	16	1.19
CD4519	16	.59
CD4520	16	1.19
CD4526	16	1.49
CD4528	16	1.49
CD4529	16	1.69
CD4543	16	1.95
CD4562	14	6.95
CD4566	16	1.39
CD4583	16	2.49
CD4584	14	.69
CD4723	16	1.19
CD4724	16	1.19
MC14409	16	13.95
MC14410	16	13.95
MC14411	24	11.95
MC14412	16	13.95
MC14419	16	7.95
MC14433	24	13.95
MC14538	16	1.19
MC14541	14	1.19

(More in Catalog)

MICROPROCESSOR COMPONENTS

MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$2.95
MCS6502	40	MPU w/Clock	5.95
MCS6502B	40	MPU w/Clock at 3MHz	9.95
6809	40	CPU—8-bit (Internal Clock) 1MHz	14.95
6809E	40	CPU—8-bit (External Clock) 1MHz	14.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N	40	CPU-Sgl. chip 8-bit (128bts. Ram)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	9.95
INS8070N	40	CPU (64 bytes RAM)	29.95
INS8073N	40	CPU w/Basic Micro Interpreter	29.95
P8085A	40	CPU	4.95
8086	40	CPU 16-bit 5MHz	24.95
8088	40	CPU 8/16-bit	29.95
8155	40	HMOS RAM I/O Port-Timer	6.95
8748	40	HMOS EPROM MPU	24.95

Z80, Z80A, Z80B, Z8000 SERIES

Z80	40	CPU (MK3880N)(780C) 2MHz	$3.95
Z80-CTC	28	Counter Timer Circuit	3.95
Z80-DART	40	Dual Asynchronous Rec./Trans	10.95
Z80-DMA	40	Direct Memory Access Circuit	9.95
Z80-P10	40	Parallel I/O Interface Controller	3.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded)	12.95
Z80-S10/1	40	Serial I/O (Lacks DTRB)	12.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB)	12.95
Z80-S10/9	40	Serial I/O	12.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz	4.49
Z80A-CTC	28	Counter Timer Circuit	4.95
Z80A-DART	40	Dual Asynchronous Rec./Trans	9.95
Z80A-DMA	40	Direct Memory Access Circuit	12.95
Z80A-P10	40	Parallel I/O Interface Controller	3.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded)	12.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB)	12.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB)	12.95
Z80A-S10/9	40	Serial I/O	12.95
Z80B	40	CPU (MK3880N-6) 6MHz	9.95
Z80B-CTC	28	Counter Timer Circuit	12.95
Z80B-DART	40	Dual Asynch. Receiver/Transmitter	19.95
Z80B-P10	40	Parallel I/O Interface Controller	12.95
Z8001	48	CPU Segmented	44.95
Z8002	40	CPU Non-Segmented	34.95
Z8030	40	Serial Comm. Controller	44.95
Z8036	40	Counter/Timer & Parallel I/O Unit	29.95

6500/6800/68000 SERIES

MC6502A	40	MPU with clock and RAM (2MHz)	6.95
MC6520	40	Peripheral Inter. Adapter	4.95
MC6800	40	MPU	2.95
MC6802CP	40	MPU with clock and RAM	7.95
MC6809E	40	CPU (1MHz) External (Locking)	14.95
MC6821	40	Peripheral Inter. Adapt (MC6820)	2.95
MC6828	24	Priority Interrupt Controller	15.95
MC6830L8	24	1024x8-bit ROM (MC68A30-8)	9.95
MC6850	24	Asynchronous Comm. Adapter	3.95
MC6852	24	Synchronous Serial Data Adapter	5.75
MC6860	24	0-600bps Digital MODEM	7.95
MC68000L8	64	MPU 16-Bit (8MHz)	49.95
MC68488P	40	General Purpose Int. Adapter	9.95
MC68652P2	40	Multi. Protocol Comm. Controller	24.95
MC68661PB	28	Enhanced Prog. Comm. Int.	9.95
MCM68764	24	64K EPROM (450ns)	24.95
SY6522	40	Peripheral Inter. Adapter	7.95

8080A SERIES

INS8080A	40	CPU	2.95
TMS5501	40	Synchronous Data Interface (SIRC)	14.95
INS8154	40	128 Byte RAM 16-Bit I/O	13.95
8156	40	RAM with I/O Port and Timer	6.95
INS82C06	20	Octal D Flip Flop Tri-State (74C374)	2.49
DP8212	24	8-bit Input/Output (74S412)	2.25
DP8214	24	Priority Interrupt Control	2.95
DP8216	16	Bi-Directional Bus Driver	1.95
DP8224	16	Clock Generator/Driver	2.25
DP8226	16	Bus Driver	2.25
DP8228	28	System Cont./Bus Driver (74S428)	3.49
DP8238	28	System Controller (74S438)	4.49
INS8243	24	I/O Expander for 48 Series	3.95
INS8245	18	16-Key Keyboard Encoder (74C922)	4.49
INS8246	20	20-Key Keyboard Encoder (74C923)	4.95
INS8247	28	Display Controller (74C911)	8.95
INS8248	28	Display Controller (74C912)	8.95
INS8250N	40	Asyn. Comm. Element	10.95
DP8251	28	Prog. Comm. I/O (USART)	4.49
DP8253	24	Prog. Interval Timer	6.95
DP8255	40	Prog. Peripheral I/O (PPI)	4.49
DP8257	40	Prog. DMA Control	5.95
DP8259	28	Prog. Interrupt Control	6.95
DP8275	40	Prog. CRT Controller	29.95
DP8279	40	Prog. Keyboard/Display Interface	8.95
DP8303	20	8-Bit Tri-State Bi-Directional Trans.	3.95
DP8304	20	8-bit Bi-Directional Receiver	2.95
DP8307	20	8-bit Bi-Directional Receiver	2.95
DP8308	20	8-bit Bi-Directional Receiver	2.95
DP8310	20	Octal Latched Peripheral Driver	4.95
8741	40	8-bit Univ. Peripheral Interface	29.95
8755	40	16K EPROM with I/O	24.95

DISK CONTROLLERS

INS1771-1	40	Single Density	16.95
FD1791	40	Single/Dual Density (Inv.)	29.95
FD1793	40	Single/Double Density (True)	29.95
FD1795	40	Dual Density/Side Select (Inv.)	29.95
FD1797	40	Dual Density/Side Select True	29.95
6843P	40	Floppy Disk Controller (1MHz)	29.95

SPECIAL FUNCTION

DS0025CN	8	Dual MOS Clock Driver (5MZ)	2.49
DS0026CN	8	Dual MOS Clock Driver (5MZ)	1.95
INS2651	28	Communication Chip	8.95
MC3470P	18	Floppy Disk Read Amp System	4.95
MM58167AN	24	Microprocessor Real Time Clock	8.95
MM58174AN	16	Micro. Compatible Time Clock	7.95
COP402N	40	Microcontroller w/64-digit RAM and Direct LED Drive	5.95
COP402MN	40	Microprocessor w/64-digit RAM & Direct LED Drive w/N Buss Int.	5.95
COP470N	20	32-seg VAC Fluor. Drvr. (20-pin pkg.)	3.25
MM5369AA/N	8	Prog. Oscillator/Divider (60Hz)	1.79
MM5369EST	8	Prog. Oscillator/Divider (100Hz)	1.95

DYNAMIC RAMS

Part No.	**Pins			Price
1103	18	1024x1	(300ns)	.99
4027	**16**	**4096x1**	**(250ns)**	**2.49**
4116N-2	16	16,384x1	(150ns)	1.89 - 8/14.95
4116N-3	16	16,384x1	(200ns)	1.69 - 8/12.95
4116N-4	16	16,384x1	(250ns)	1.49 - 8/10.95
4164N-150	16	65,536x1	(150ns)	6.95 - 8/49.95
4164N-200	16	65,536x1	(200ns)	5.95 - 8/44.95
MM5261	18	1024x1	(300ns)	.49 - 8/1.95
MM5262	**22**	**2048x1**	**(365ns)**	**.49 - 8/1.95**
MM5270	18	4096x1	(250ns) MK4096	4.95
MM5280	22	4096x1	(200ns) 2107	3.95
MM5290-2	16	16,384x1	(150ns)	1.89 - 8/14.95
MM5290-3	16	16,384x1	(200ns)	1.69 - 8/12.95
MM5290-4	16	16,384x1	(250ns)	1.49 - 8/10.95
MM5298-3	16	8192x1	(200ns)	1.69

STATIC RAMS

1101	16	256x1	(650ns)	1.49
2101	22	256x4	(450ns) 8101	2.49
2102	16	1024x1	(350ns)	.89
21L02	16	1024x1	(450ns) L.P.	1.49
2111	18	256x4	(450ns) 8111	2.95
2112	16	256x4	(450ns) MOS	1.95
2114	18	1024x4	(450ns)	1.49 - 8/9.95
2114L	18	1024x4	(450ns) L.P.	1.95 - 8/13.95
2114-2	18	1024x4	(200ns)	1.75 - 8/11.95
2114L-2	18	1024x4	(200ns) L.P.	2.25 - 8/14.95
2147	18	4096x1	(70ns)	4.95
2148	18	1024x4	(70ns)	4.95
TMS4045	18	1024x4	(450ns)	3.95
TMS40L47-45	20	1024x4	(450ns)	2.95
5101	22	256x4	(450ns) CMOS	2.95
MM5257	18	4096x1	(450ns) 4044	4.95
HM6116P-3	24	2048x8	(150ns) CMOS	5.95
HM6116-4	24	2048x8	(200ns) CMOS	4.95
HM6116LP-4	24	2048x8	(200ns) L.P. CMOS	5.49
HM6264P-15	28	8192x8	(150ns) CMOS	39.95
27LS00	16	256x1	(80ns) L.P.	9.95
7489	16	16x4	(50ns) 3101	2.25
74C920	22	256x4	(250ns)	3.95
74C921	18	256x4	(250ns) CMOS	3.95
74C929	16	1024x1	(250ns) CMOS (6501)	3.95
74C930	18	1024x1	(250ns) CMOS (6518)	3.95
74S189	16	16x4	(35ns) 93405	1.95
74S200	16	256x1	(80ns) 93410	3.95
74S206	16	256x1	(60ns) 93411	3.95
74S289	16	16x4	(35ns) 3101	2.25
82S10	16	1024x1	(50ns) O.C. (93415)	3.95
82S25	16	16x4	(50ns) O.C. (74S289)	2.25

PROMS/EPROMS

1702A	24	256x8	(1us)	4.95
2708	24	1024x8	(450ns)	3.95
2708-5	24	1024x8	(550ns) SM00246	2.95
TMS2516	24	2048x8	(450ns) 2716	5.95
TMS2532	24	4096x8	(450ns) NMC2532	6.95
TMS2564	28	8192x8	(450ns)	14.95
TMS2716	24	2048x8	(450ns) 3 voltage	9.95
2716	24	2048x8	(450ns)	4.95
2716-1	24	2048x8	(350ns)	5.95
27160-5	24	2048x8	(550ns)	4.49
2732	24	4096x8	(450ns)	6.95
2732A-3	24	4096x8	(300ns)	7.95
2732A-4	24	4096x8	(450ns) 21V	6.95
27320-4	24	4096x8	(550ns)	5.95
27580-A	24	1024x8	(450ns)	2.95
2764-4	28	8192x8	(450ns)	9.95
2764-3	28	8192x8	(300ns)	14.95
MM52040	24	512x8 (1us)		4.95
MCM68764	24	8192x8	(450ns)	24.95
27128	28	16,384x8	(450ns) 128K EPROM	59.95
74S188	16	32x8	PROM O.C. (6330-1)	1.49
74S287	16	256x4	PROM T.S. (6301-1)	1.95
74S288	16	32x8	PROM T.S. (6331-1)	1.95
74S387	16	256x4	PROM O.C. (6300-1)	1.95
74S471	20	256x8	PROM T.S. (6309-1)	5.95
74S472	20	512x8	PROM T.S. (6349-1)	4.95
74S473	20	512x8	PROM O.C. (6348)	4.95
74S474	24	512x8	PROM T.S. (DM87S296N)	4.95
74S475	24	512x8	PROM O.C. (6340)	4.95
74S476	18	1024x4	PROM T.S.	6.95
74S478	24	1024x8	PROM T.S.	8.95
74S570	16	512x4	PROM O.C. (6305)	2.95
74S571	16	512x4	PROM T.S. (6306)	2.95
74S572	18	1024x4	PROM O.C. (6352)	4.95
74S573	18	1024x4	PROM T.S. (82S137)	4.95
82S23	16	32x8	PROM O.C. (27S18)	2.95
82S115	24	512x8	PROM T.S. (27S15)	9.95
82S123	16	32x8	PROM T.S. (27S19)	2.95
82S126	16	256x4	PROM O.C. (27S20)	2.95
82S129	16	256x4	PROM T.S. (27S21)	2.95
82S130	16	512x4	PROM O.C. (27S12)	3.95
82S185	18	2048x4	PROM T.S. (TBP24S81)	9.95
82S190	24	2048x8	(80ns)	14.95
82S191	24	2048x8	(80ns)	14.95
DM87S180N	24	1024x8	PROM O.C. (82S180)	9.95
DM87S181N	24	1024x8	PROM T.S. (82S181)	9.95
DM87S184N	18	2048x4	PROM O.C. (82S184)	9.95
DM87S185N	18	2048x4	PROM T.S. (82S185)	9.95
DM87S190N	24	2048x4	PROM O.C. (82S190)	14.95
DM87S191N	24	2048x8	PROM T.S. (82S191)	14.95

DATA ACQUISITION

DC10		Mostek DC/DC Convert. +5V to -9V	2.95
MC3470P	18	Floppy Disk Read AMP System	4.95
MC1408L7	16	7-bit D/A Converter (DAC0807LCN)	1.49
MC1408L8	18	8-bit D/A Converter (DAC0808LCN)	2.25
ADC0803LCN	20	8-bit A/D Converter (±1/2LSB)	4.95
ADC0804	20	8-bit A/D Converter (1LSB)	3.49
DAC0806	16	8-bit D/A Converter (0.78% Lin.)	1.95
ADC0809	28	8-bit A/D Converter (8-Ch. Multi.)	4.49
ADC0817	40	8-bit A/D Converter (16-Ch. Multi.)	9.95
DAC1000	24	10-bit D/A Conv. Micro. Comp. (0.05%)	7.95
DAC1008	20	10-bit D/A Conv. Micro. Comp. (0.20%)	6.95
DAC1020	16	10-bit D/A Conv. (0.05% Lin.)	7.95
DAC1022	16	10-bit D/A Conv. (0.20% Lin.)	5.95
DAC1222	18	12-bit D/A Conv. (0.20% Lin.)	6.95
LM334Z		Constant Current Source	1.19
LM335Z		Temperature Transducer	1.40
LM399H		Temp. Comp. Prec. Ref. (.5ppm/C°)	5.00
AY-5-1013A	**40**	**30K Baud Uart (TR1602)**	**3.95**

LOW PROFILE (TIN) SOCKETS

	1-9	10-99	100-up
8 pin LP	.16	.14	.13
14 pin LP	.17	.15	.14
16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.46	.43

SOLDERTAIL (GOLD) STANDARD

	1-9	10-99	100-up
8 pin SG	.30	.27	.25
14 pin SG	.43	.39	.37
16 pin SG	.47	.43	.41
18 pin SG	.53	.49	.47
24 pin SG	.69	.65	.61
28 pin SG	.81	.76	.72
36 pin SG	1.09	1.03	.97
40 pin SG	1.21	1.14	1.08

LP SG ST WW

SOLDERTAIL STANDARD (TIN)

	1-9	10-99	100-up
14 pin ST	.29	.27	.25
16 pin ST	.34	.32	.30
18 pin ST	.38	.36	.34
20 pin ST	.45	.43	.41
24 pin ST	.49	.46	.43
28 pin ST	.69	.67	.63
40 pin ST	.99	.95	.89

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-9	10-99	100-up
8 pin WW	.49	.45	.42
10 pin WW	.65	.62	.59
14 pin WW	.65	.62	.59
16 pin WW	.69	.65	.61
18 pin WW	.89	.85	.79
20 pin WW	1.09	1.05	.99
22 pin WW	1.25	1.19	1.15
24 pin WW	1.29	1.23	1.18
28 pin WW	1.59	1.50	1.45
36 pin WW	1.85	1.75	1.69
40 pin WW	1.99	1.89	1.79

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Shipping — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30¢ each
Send $1.00 Postage for your
FREE 1984 JAMECO CATALOG
Prices Subject to Change

MasterCard

Mail Order Electronics · Worldwide

Jameco® ELECTRONICS

VISA®

1355 SHOREWAY ROAD, BELMONT, CA 94002

2/84 ***PHONE ORDERS WELCOME — (415) 592-8097 Telex: 176043***

Digitalker™

DT1050 — Applications: Teaching aids, appliances, clocks, automotive, telecommunications, language translations, etc.

The DT1050 is a standard DIGITALKER kit encoded with 137 separate and useful words, 2 tones, and 5 different silence durations. The words and tones have been assigned discrete addresses, making it possible to output single words or words concatenated into phrases or even sentences. The "voice" output of the DT1050 is a highly intelligible male voice. Female and children's voices can be synthesized. The vocabulary is chosen so that it is applicable to many products and markets.

The DT1050 consists of a Speech Processor Chip, MM54104 (40-pin) and two (2) Speech ROMs MM52164SSR1 and MM52164SSR2 (24-pin) along with a Master Word list and a recommended schematic diagram on the application sheet.

DT1050 Digitalker™ .... $34.95 ea.
MM54104 Processor Chip .... $14.95 ea.

DT1057 - Expands the DT1050 vocabulary from 137 to over 260 words. Includes 2 ROMs and specs.
Part No. DT1057 .... $24.95 ea.

INTERSIL

*Evaluation Kits

Part No.	**Pins	Function	Price
7045IPI	28	CMOS Precision Timer	14.95
7045EV/Kit*	28	Stopwatch Chip, XTL	19.95
7106CPL	40	3½ Digit A/D (LCD Drive)	9.95
FE0203D		3½ Digit LCD Display for 7106 & 7116	19.95
7106EV/Kit*	40	IC, Circuit Board, Display	34.95
7107CPL	40	3½ Digit A/D (LED Drive)	11.95
7107EV/Kit*	40	IC, Circuit Board, Display	29.95
7116CPL	40	3½ Digit A/D LCD Dis. HLD.	16.95
7201IUS		Low Battery Volt Indicator	2.25
7205IPG	24	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	24	Stopwatch Chip, XTL	14.95
7206CJPE	16	Tone Generator	4.95
7206CEV/Kit*	16	Tone Generator Chip, XTL	7.95
7207AIPD	14	Oscillator Controller	5.95
7207AEV/Kit*	14	Freq. Counter Chip, XTL	7.95
7215IPE	24	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	24	4 Func. Stopwatch Chip, XTL	14.95
7216AIJI	28	8 Digit Univ. Counter C.A.	29.95
7216CIJI	28	8 Digit Freq. Counter C.A.	24.95
7216DIPI	28	8 Digit Freq. Counter C.C.	19.95
7217IJI	28	4 Digit LED Up/Down Counter C.A.	10.95
7217AIPI	28	4 Digit LED Up/Down Counter C.C.	11.95
7224IPL	40	LCD 4½ Digit Up Counter DRI	10.95
7226AIJL	40	8 Digit Univ. Counter	29.95
7226AEV/Kit*	40	5 Function Counter Chip, XTL	74.95

30009 1983 INTERSIL Data Book (1356p.) **$9.95**

NEW PRODUCT! 74HC High Speed CMOS

74HC00	14	.59
74HC02	14	.59
74HC03	14	.75
74HC04	14	.59
74HCU04	14	.65
74HC08	14	.59
74HC10	14	.59
74HC11	14	.59
74HC14	14	.85
74HC20	14	.59
74HC27	14	.59
74HC32	14	.75
74HC42	16	.99
74HC51	14	.75
74HC58	14	.75
74HC73	14	.79
74HC74	14	.79
74HC75	16	.89
74HC76	16	.79
74HC85	16	1.59
74HC86	14	.69
74HC107	14	.79
74HC109	16	.79
74HC112	16	.79
74HC113	14	.79
74HC132	14	.99
74HC137	16	1.95
74HC138	16	1.09
74HC139	16	.99
74HC147	16	1.19
74HC151	16	.89
74HC153	16	.99
74HC154	24	2.49
74HC157	16	.89
74HC158	16	.89
74HC160	16	1.29
74HC161	16	1.29
74HC162	16	1.29
74HC163	16	1.29
74HC164	14	1.29
74HC165	16	2.79
74HC173	16	1.69
74HC174	16	.99
74HC175	16	.99
74HC192	16	1.39
74HC193	16	1.39
74HC194	16	1.09
74HC195	16	1.09
74HC237	16	2.95
74HC240	20	1.95
74HC241	20	1.95
74HC242	14	1.95
74HC243	14	1.95
74HC244	20	1.95
74HC245	20	2.49
74HC251	16	.89
74HC253	16	.99
74HC257	16	.89
74HC259	16	1.49
74HC266	14	1.19
74HC273	20	2.89
74HC280	14	3.95
74HC373	20	2.39
74HC374	20	2.39
74HC390	16	1.49
74HC393	14	1.49
74HC533	20	2.39
74HC534	20	2.39
74HC595	16	3.95
74HC688	20	3.19
74HC4002	14	.59
74HC4017	16	2.19
74HC4020	16	1.39
74HC4024	14	1.59
74HC4040	16	1.39
74HC4060	16	1.39
74HC4075	14	.59
74HC4078	14	.69
74HC4511	16	2.69
74HC4514	24	3.79
74HC4538	16	2.39
74HC4543	16	3.49

74HCU04 is unbuffered. All others are buffered.

NEW Programmable Array Logic (PALS)

Part No.	**Pins	Function	Price
PAL10H8	20	Octal 10-Input AND-OR Gate Array (High Output)	$3.95
PAL12H6	20	Hex 12-Input AND-OR Gate Array (High Output)	3.95
PAL14H4	20	Quad 14-Input AND-OR Gate Array (High Output)	3.95
PAL10L8	20	Octal 10-Input AND-OR-Invert Gate Array (Low Output)	3.95
PAL12L6	20	Hex 12-Input AND-OR-Invert Gate Array (Low Output)	3.95
PAL14L4	20	Quad 14-Input AND-OR-Invert Gate Array (Low Output)	3.95
PAL16L8	20	Octal 16-Input AND-OR-Invert Gate Array	9.95
PAL16R8	20	Octal 16-Input Register AND-OR Gate Array	7.95
PAL16R6	20	Hex 16-Input Register AND-OR Gate Array	7.95
PAL16R4	20	Quad 16-Input Register AND-OR Gate Array	7.95

30012 1982 NATIONAL PAL Data Book (176p.) .. **$5.95**

74C—C/MOS

74C00	14	.35
74C02	14	.35
74C04	14	.29
74C08	14	.35
74C10	14	.35
74C14	14	.69
74C20	14	.35
74C30	14	.35
74C32	14	.39
74C42	16	1.39
74C48	16	1.95
74C73	14	.79
74C74	14	.69
74C85	16	1.95
74C86	14	.39
74C89	16	5.95
74C90	14	1.19
74C93	14	1.19
74C95	14	1.39
74C107	14	.89
74C151	16	2.49
74C154	24	3.49
74C157	16	2.25
74C160	16	1.19
74C161	16	1.19
74C162	16	1.19
74C163	16	1.19
74C164	14	1.49
74C173	16	1.19
74C174	16	1.19
74C175	16	1.19
74C192	16	1.49
74C193	16	1.69
74C195	16	1.39
74C221	16	1.95
74C240	20	1.95
74C244	20	1.95
74C373	20	2.49
74C374	20	2.49
74C901	14	.59
74C903	14	.59
74C906	14	.59
74C911	28	8.95
74C912	28	8.95
74C915	18	1.19
74C917	28	8.95
74C922	18	4.49
74C923	20	4.95
74C925	16	5.95
74C926	18	5.95
80C95	16	.69
80C97	16	.69

LINEAR

TL071CP	8	.79
TL072CP	8	1.39
TL074CN	14	1.95
TL081CP	8	.59
TL082CP	8	1.19
TL084CN	14	1.95
LM301CN	8	.35
LM302H		1.95
LM304H		1.95
LM305H		.99
LM307CN	8	.45
LM308CN	8	.69
LM309K		1.25
LM310CN	8	1.75
LM311CN	8	.69
LM312H		2.49
LM317T		1.19
LM317K		3.95
LM318CN	8	1.95
LM319N	14	1.95
LM320K-5		1.35
LM320K-12		1.35
LM320K-15		1.35
LM320T-5		.89
LM320T-12		.89
LM320T-15		.89
LM323K		5.95
LM324N	14	.59
LM337T		1.95
LM338K		8.95
LM339N	14	.69
LM340K-5		1.35
LM340K-12		1.35
LM340K-15		1.35
LM340T-5		.79
LM340T-12		.79
LM340T-15		.79
LF347N	14	1.49
LM348N	14	.99
LM350K		4.95
LF355N	8	1.10
LF356N	8	1.10
LM370N	14	4.49
LM373N	14	3.95
LM377N	14	1.95
LM380N	14	.89
LM381N	14	1.79
LM382N	14	1.39
LM384N	14	1.79
LM386N-3	8	.89
TL494CN	16	3.95
TL496CP	8	1.19
NE531V	8	2.95
NE544N	14	2.95
NE550A	14	1.95
NE555V	8	.35
LM556N	14	.69
NE564N	16	2.95
LM565N	14	1.19
LM566CN	8	1.49
LM567V	8	.99
NE570N	16	3.95
LM703CN	8	1.19
LM709N	14	.49
LM710N	14	.69
LM711N	14	.79
LM723N	14	.55
LM733N	14	1.00
LM739N	14	1.95
LM741CN	8	.35
LM747N	14	.69
LM748N	8	.59
LM1310N	14	1.49
LM1458CN	8	.59
LM1488N	14	.89
LM1489N	14	.89
LM1496N	14	1.95
LM1800N	16	2.49
LM1871N	18	2.95
LM1872N	18	3.25
LM1877N-9	14	2.49
LM1889N	18	2.25
LM1896N	14	2.95
LM2002T		1.95
LM3189N	16	1.59
LM3900N	14	.59
LM3905CN	8	1.19
LM3909N	8	.99
LM3914N	18	2.95
LM3915N	18	2.95
LM3916N	18	2.95
RC4136N	**14**	**1.25**
RC4151NB	8	1.95
RC4194TK		4.49
NE5532	8	2.49
NE5534	8	1.69
ICL8038B	14	3.95
LM13080N	8	1.19
LM13600N	16	1.19

MORE AVAILABLE

30003 1982 Nat. Linear Data Book (1952 pgs.) . **$11.95**

Circle 41 on Reader Service card.

Peterborough NH 03458

Microcomputing® ● List of Advertisers

Reader Service Number		Page
232	A-1 Computer Paper Co.	143
486	Adaptec, Inc.	138
181	AFIPS	41
475	Applied Software Technology	130
58	Atari SW	11
269	BG Micro	85
112	Bill Cole Enterprises	123
401	Blue Chip Software	117
8	BRS	81
396	Bytek Computer Systems Corp.	58
283	CGRS Microtech	87
369	Cardco, Inc.	CII
98	Cases, Inc.	63
170	Chips & Dale	37
90	Compucover	143
482	CompuSource, Inc	134
18	Computer Design Labs	45
185	Computer Friends	110
480	Computer Technology Associates	134
488	Comrex International, Inc.	136
297	Concord Computer Products	111
472	Connections, Inc.	133
484	Corvus Systems	138
252	Cuesta Systems	143
23	Data Base Industries	51
468	DataEncore	129
310	Data Terminals & Communications	49
355	Dennison Computer Supplies, Inc.	CIV
493	Digital Laboratories, Inc.	138
402	Digital Research	117
*	Digital Research Computers	112, 113
392	Diskette Connection	127
466	EZ Ware, Inc.	129
487	Eagle Computer, Inc.	135
60	Eastern House Software	50
169	Elcomp Publishing, Inc.	121
21	Elek-Tek, Inc.	40
192	Ellis Computing	139
52	Engineering Specialities	143
78	Expotek	73
474	Fountain Computer Products	130
307	Friendly Computer Center	21
177	Global Equipment Company	87
17	Gloucester Computer, Inc.	96
6	H & E Computronics	CIII
285	IBM	74, 75
*	ICS	55, 123
99	IPF Company	97
*	inCider Subscriptions	126
128	Innovative Technology	143
464	Interactive Systems Corp.	128
134	JV Software	143
41	Jameco Electronics	114
462	Kaypro Corporation	128
409	Krell Software Corp.	117
492	LNW Computers	135
165	Lyben Computer Systems	132
204	Lyben Computer Systems	132
316	MFJ Enterprises	57
66	Mastermind Computing	54

Reader Service Number		Page
115	Mechanix Illustrated	78
239	Micro Craft Corp.	65
143	Micro Innovations	132
467	Micro Visions	129
470	Microcom, Inc.	130
*	**Microcomputing**	
	*Back Issues	133
	*Dealer Sell	144
	*Foreign Dealers	143
	*Microcomputing Subscriptions	18
	*Moving	133
	*73 Ad	145
	*Subscription Problems	143
	*University Micros	143
460	Micronetics, Inc.	128
407	Microstuf, Inc.	116
473	Midwest Software Associates	129
463	Molecular Computer	128
403	Montezuma Micro	117
404	Multisoft Corp.	117
*	NRI Schools	101
126	Omnitronix	50
202	Orcim Corporation	132
263	Palantir Software	9
179	Paradigm Consultants	79
489	Picotronics, Inc.	135
471	Peachtree Software, Inc.	133
309	Precision Data Products	125
386	Public Domain	55
270	QMT	13
15	Rio Grande Software	123
465	Rhintek, Inc.	128
191	Riverlake Systems	127
*	RUN Subscription ad	131
495	Savergy, Inc.	138
14	Sintec	127
132	Sixty Eight Micro Journal	132
408	SoftCraft	116
271	Softlogic Solutions	59
211	Software Services	132
361	Star Micronics, Inc.	3
405	State of the Art	116
469	Stoneware, Inc.	129
494	Sunol Systems	136
244	Sun Research, Inc.	80
295	SWP, Inc.	15
189	Tab Sales	127
481	TeleVideo Systems, Inc.	134
241	Thirdware Computer Products	17
406	TMQ Software, Inc.	116
341	TMSI	95
485	Vector Graphic, Inc.	135
	Wayne Green Inc.	
367	Kilobaud Classroom	144
367	Robotics Contest	137
367	Shelf Boxes	144
367	WG Books	34
216	Western Wares	132
296	Writing Consultants	132
483	Xerox Corp.	134

*This advertiser prefers to be contacted directly.

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

For further information from our advertisers, please use the Reader Service card.

Micro Software Digest

Compiled by Tracy Mayor

Micro Software Digest presents capsulized software reviews from various computer-related publications.

File-Fax

System Requirements: Apple II or II Plus; one disk drive
Manufacturer: TMQ Software, Inc., 82 Fox Hill Drive, Buffalo Grove, IL 60090
Price: $149
Comments: File-Fax is an easy-to-learn database package for Apple machines. You can define keys to control filing and sorting data according to your own criteria. Several on-disk help screens make the program nonintimidating.

The review applauds the manufacturer for taking pains to "eliminate problems and areas of awkwardness found in other database management systems." Searching and sorting capabilities are flexible, and the system can expand to support up to eight disk drives.

Although command formats are nonstandard, the program is highly recommended overall. Reader Service number 406.

(Reviewed in MICRO, *September 1983)*

Accounts Receivable

System Requirements: Apple II or II Plus; 48Kb RAM; ROM Applesoft; one disk drive
Manufacturer: State of the Art, 3183-A Airway Ave., Costa Mesa, CA 92626
Price: $495
Comments: Accounts Receivable is one part of an accounting package designed "to take the paper shuffling out of business." Each module of the package can be used "independently or in conjunction with each other."

Accounts Receivable offers access to a wide variety of account information easily. You can create a number of files easily, including a division file, terms code file, sales tax file and salesperson file.

Day-to-day accounting is handled, along with the ability to keep a sales journal, a general ledger detail report and an aged invoice report.

"With access to so many reports," you "can quickly obtain an almost endless variety of information." Reader Service number 405.

(Reviewed in Softalk, *October 1983)*

Crosstalk XVI

System Requirements: IBM PC or XT, Victor 9000, Compaq, Eagle 1600 or any other MS DOS machine; 96Kb RAM; one disk drive; modem
Manufacturer: Microstuf, Inc., 1845 The Exchange, Suite 140, Atlanta, GA 30339
Price: $195
Comments: This latest version of Crosstalk is a terminal emulator program written in assembly language that takes advantage of both MS DOS and 16-bit memory capacities. According to the review, "'It just don't get much better than this.'"

The program supports capabilities commonly found in terminal emulation programs and also offers the ability to receive data on disk files and to transmit disk files. A Capture to RAM and Capture to Disk mode are special enhancements; the former is especially helpful with electronic mail systems.

Crosstalk features a host of other operational and transmission features and can emulate specific terminals. Reader Service number 407.

(Reviewed in InfoWorld, *October 3, 1983)*

Btrieve

System Requirements: IBM PC; 64Kb; one disk drive
Manufacturer: SoftCraft, PO Box 9802 #590, Austin, TX 78766
Price: $145
Comments: If you're in the market for file-handling software that works well with high-level languages, Btrieve is for you. The program is designed to enhance the rudimentary file-handling capabilities of IBM Basic, Pascal, Microsoft C and other languages.

Btrieve sports 22 file management commands but doesn't slow performance time. The program uses a Btree configuration, which permits logical filing according to size.

The program supports a variable-size buffer, automatic file recovery on system crash and partitioned files across disks.

According to the review, "Btrieve is a high-quality tool that is worthy of serious consideration by anyone writing applications programs." Reader Service number 408.

(Reviewed in PC World, *December 1983)*

StretchCalc

System Requirements: IBM PC; 128Kb; one disk drive; VisiCalc; graphics board and monitor; a printer is advantageous
Manufacturer: Multisoft Corp., 14025 SW Farmington Road, Beaverton, OR 97005
Price: $99, $49 without graphics
Comments: If you're a VisiCalc fan who wants graphics, data management and spreadsheet enhancements, look into StretchCalc. The package is designed to work hand-in-hand with VisiCalc.

StretchCalc adds more than 20 commands to VisiCalc. It's possible to define long character strings with one or two keystrokes. The package has a total of 66 programmable keys—each holds up to 80 characters.

Graphing capabilities are especially easy—graphs can be modified on-screen. If you aren't interested in graphing your spreadsheets, a stripped down version of StretchCalc is available.

The review recommends, for VisiCalc owners who "need integrated graphics and keyboard macros. . .a small investment will bring great returns." Reader Service number 404.

(Reviewed in PC World, *October 1983)*

CBasic Compiler 1.4

System Requirements: Z80- or 8080-based computer; CP/M; 64Kb RAM; one disk drive
Manufacturer: Digital Research, PO Box 579, Pacific Grove, CA 93950
Price: $500
Comments: As the review observes, the CBasic Compiler (CB80) has "almost too many features to be called a Basic." The eight-bit compiler produces 8080 code that you can "put into ROM and .COM files for the CP/M operating system."

CB80 supports full error-trapping, file locking, multiple printer attachment and, perhaps most impressive, "truly structured programming."

Variable control is impressive—complete string manipulating and arithmetic functions are supported.

"CB80 I/O facilities surpass those of every other Basic I have worked with. Overall, it is the most full-featured compiler I have ever used," the reviewer enthuses. Reader Service number 402.

(Reviewed in InfoWorld, *September 26, 1983)*

Millionaire

System Requirements: Atari 400/800, Commodore-64 or Apple III
Manufacturer: Blue Chip Software, 19537 Wells Drive, Tarzana, CA 91356
Price: $59.95–$69.95
Comments: Now the stockmarket really *is* a game—Millionaire lets you learn the ins and outs of Wall Street without losing your shirt.

You can choose stocks from five major industries: oil and gas, automobiles, retail sales, heavy industry and, of course, computers. The program provides you with corporate histories, stock price tables and a News Journal to help guide your decisions.

Starting with $10,000 at the novice level, you can proceed to the ranks of broker if you read the provided variables correctly.

As the review observes, Millionaire is "quite an education in the art, or science, of playing the stock market." Reader Service number 401.

(Reviewed in COMPUTE!, *December 1983)*

CP/M 2.2

System Requirements: TRS Model 4; one disk drive
Manufacturer: Montezuma Micro, PO Box 32027, Dallas, TX 75232
Price: $199
Comments: If you've been searching for a CP/M system for your TRS-80 Model 4, the long wait is over. Montezuma Micro's CP/M 2.2 features all the standard CP/M utilities plus a few extras, including "Ed, Submit, PIP and ASM." The public-domain program Modem is also included, modified to run on the Model 4's hardware.

It's possible to read 5¼-inch disks created by other computers. Montezuma has added menus to the package in an attempt to overcome some of the inherent clumsiness in CP/M systems.

The documentation is thorough; a copy of a popular CP/M book is also included. Concludes the review, "This version of CP/M is more than satisfactory." Reader Service number 403.

(Reviewed in InfoWorld, *December 5, 1983)*

College Board SAT

System Requirements: Apple II or IIe, Atari 400 or 800, Commodore-64, Franklin 1000 series, IBM PC or TRS-80 Model I or III; one disk drive
Manufacturer: Krell Software Corp., 1320 Stony Brook Road, Stony Brook, NY 11790
Price: $299.95
Comments: SAT scores weigh heavily on the desks of most college admissions officers. Several companies are offering software packages designed to help would-be collegians bone up on the verbal and math basics in anticipation of the big test day.

Krell software even offers a money-back guarantee if scores don't improve by at least 70 points. The verbal skills program tests for antonyms and analogies and offers quick feedback—missed questions are covered again to reinforce learning.

The math section has an automatic learning mode that quizzes according to a student's past performance.

Familiarity is also a key factor in test performance, and the review concludes that College Board SAT is "superior" in "relieving test anxiety." Reader Service number 409.

(Reviewed in Popular Computing, *October 1983)*

COMPUTE!, published by Small Systems Services, Inc., PO Box 5406, Greensboro, NC 27403.

InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701.

MICRO, published by Micro Ink, PO Box 6502, Chelmsford, MA 01824.

PC World, published by PC World Communications, Inc., 555 DeHaro St., San Francisco, CA 94107.

Popular Computing, published by BYTE Publications, Inc., 70 Main St., Peterborough, NH 03458.

Softalk, 11160 McCormick St., North Hollywood, CA 91601.

Table. Addresses of the magazines publishing software reviews digested in this department.

Rating CP/M Software
Vintage VisiCalc Advice
A Classic in Computer Communications
Understanding Assembly Language

A Critic's Guide to Software For CP/M Computers

Phillip I. Good
Chilton, 1983
Radnor, PA 19089
Softcover, 223 pp., $12.95

Phillip Good begins his *Critic's Guide to Software for CP/M Computers* by observing that software quality today varies widely from the amateurish to the professional. And the best advice for anyone buying software is Sergeant Esterhouse's advice on television's *Hill Street Blues*—"Be careful out there."

Fortunately, *A Critic's Guide* significantly reduces consumer risk by arming you with facts, procedures and expert opinion. From hands-on experience, Good evaluates 135 of the best-known, best-performing, best-buy CP/M programs (along with a few turkeys) in this "how-to" book that will save you money and help you find software that meets your requirements for application, ease of use and price.

Everyone can make use of a spreadsheet, a word processor and a data manager; Good lists the many household and small-business tasks that can be assigned to these programs. He seems to prefer MultiPlan for spreadsheets (in spite of its slowness in handling common operations and calculations) and Spellbinder for word processing (because its editor and formatter load together, making it possible for you to print a letter as soon as it is written).

But in his evaluations of MultiPlan and Spellbinder, as in each of the many recommendations in *A Critic's Guide*, he suggests several alternatives. Wisely, he refuses to pick the best in the classes because the "best" always depends on matching a program's features to a user's needs.

No Slush

You won't get any unqualified product recommendations from this witty and reliable critic. But you will get lively comparisons, often head-to-head, of the perks and pitfalls of these popular programs when tested on real-life applications. VisiCalc and SuperCalc are compared head-to-head, for example, as are the five leading database management applications generators.

Along with well-known programs like SuperCalc, WordStar and dBaseII, this book evaluates unfamiliar but surprisingly useful software, like Microtools (to encrypt your data files) and Mini-Max, a linear programming package that finds optimal solutions for investment and production problems—selecting a stock portfolio or designing a sales strategy.

Six chapters in the guide are devoted to software for small businesses, accountants, agriculturalists, attorneys, project managers, doctors and dentists. Aside from trade journals, *A Critic's Guide* is one of the few sources for factual, practical comparisons of software aimed at these narrow but important vertical markets.

A Critic's Guide also reviews six mathematical and statistical software tools for scientists and engineers. Programming professionals who want to develop their own software will find 27 CP/M-based computer-language compilers and interpreters evaluated and compared. Product comparisons with authoritative recommendations are hard to find for these specialized subjects.

The book is well-organized. You'll find the vendor's name, address and phone number adjacent to each review. Good's guide includes 36 illustrations taken directly from the manuals and output of the leading software packages, including SuperCalc, Target, Solomon and Good's choice for health professionals, the Medical Manager. (But why SuperCalc rather than SuperCalc2? And why does Good devote such a lengthy review to the little-known Solomon accounting package, while sparing only a few paragraphs for Accounting Plus?)

As a bonus, you get easy-to-compare profiles of 11 popular CP/M computers, including Kaypro, the ill-fated Osborne, TRS-80, Vector and Zenith/Heath.

Opinion with Fact

The guide gives you opinion, but with the facts to support it. Good says Spellbinder is a best buy because it is both a word processor and a personal file manager. In his chapter on software for health professionals, Good shows that a billing system in a doctor's office can easily pay back the cost of an entire computer system in less than a year.

Some of the opinions may surprise you. For example, Good describes WordStar, the best-selling word processor, as bulky, hard to use, impractical for short letters, outdated and poorly documented.

A Critic's Guide may be most valuable for its clearly defined selection procedures and checklists. These turn any consumer into a computer consultant. With the nine checklists, you can define, evaluate and select products for your software and hardware needs.

One checklist defines the essential characteristics of software in general; another lists the essentials of statistical software. You'll find checklists to evaluate spreadsheets, data management systems and general ledger accounting modules. There's a checklist for selecting a computer and even one for contract negotiations.

These checklists and the essential information they provide give this book value far beyond present-day CP/M-based software and well into the future.

Good Information

Finding the right software for your needs is not an easy task. *A Critic's Guide to Software for CP/M Computers* provides expert opinion about what's on the market now and procedures to evaluate new products as they are introduced.

Be careful—it's a jungle out there. Read this guide and avoid the software blues.

Bud Brewster
Franklin Park, IL

Dynamics of VisiCalc

Barry D. Bayer and Joseph Sobel
Dow Jones-Irwin, 1983
1818 Ridge Road
Homewood, IL 60430
Softcover, 190 pp., $19.95

You would think that the grandfather of the electronic spreadsheets—VisiCalc—has been around long enough for it to be thoroughly dissected, revealed and expounded upon, without much left to be said.

However, when you consider the myriad special applications VisiCalc can handle, it's no wonder that new information constantly surfaces. Such is the case with *Dynamics of VisiCalc*. Authors Barry D. Bayer and Joseph J. Sobel draw on their professions of law and accounting, together with extensive microcomputer experience, to help you expand your understanding of VisiCalc.

What I like best about this text is the fresh approach to using VisiCalc. Rather than a collection of VisiCalc templates, or a tutorial on basic VisiCalc commands, *Dynamics of VisiCalc* provides new or previously undocumented information useful in building your own templates to do exactly what you want.

According to the authors, canned templates usually require extensive changes to fit a unique situation, thus it's more difficult to use them than it would be to think the problem through from the outset. With proper design from the start, your own worksheets will be easy to revise as needs change.

Built on These Premises

Bayer and Sobel build the text around two major premises. First, you need an understanding of VisiCalc's capabilities and how to use them. Second, you need a knowledge of your unique application. This book shows how to combine your knowledge of a specific problem with expanded VisiCalc skills to produce the exact template required.

Helpful hints are incorporated throughout *Dynamics of VisiCalc*. Right up front is a discussion of the various versions of VisiCalc for different computers. For example, are you aware that there is a serious problem with a certain VisiCalc release for the Apple IIe and that the old version should be updated as soon as possible?

And, if you constantly expand the size of a worksheet by entering data past previous bounds, VisiCalc will pause as it reallocates memory. A simple technique is provided to get around this annoyance.

From Tidbits to Bulk

But more than these interesting tidbits, the bulk of *Dynamics of VisiCalc* presents in-depth information, such as the most efficient way to design a template, taking into account items like a separate data, calculation and report area. The book shows how to use variables rather than actual data in cell references to make revisions easy; it also covers a clever way to print out row and border headings (which saves considerable time when debugging a complex worksheet).

True to the author's promise, fully two-thirds of this book is devoted to advanced topics rarely found anywhere else. For instance, many versions of VisiCalc contain an undocumented "exec" capability that permits you to store a series of keystrokes for later automatic execution, much like Lotus 1-2-3's macro facility.

Even though the authors had no intention of providing complete models, Chapter 6, "Designing an Application," is a useful case study in analyzing a problem and creating a model to make the necessary calculations. While this model probably cannot be used as written, it is nevertheless interesting to see how this specific problem was tackled. Much of the logic can be applied to your own work.

For those requiring advanced functions, two chapters are devoted to VisiCalc Advanced. After reading this information, you can decide whether the additional cost is justified for your needs.

I would question, though, the need for including a command reference and function reference in the appendix. The authors' style certainly makes these concepts more intelligible, but there is only so much to be said about standard VisiCalc operations.

The most important attribute of *Dynamics of VisiCalc* is the inclusion of so much important, useful information that will help you design better templates, together with a fuller understanding of the nuances of VisiCalc.

Michael Heck
Harleysville, PA

The Complete Handbook Of Personal Computer Communications

Alfred Glossbrenner
St. Martins Press, 1983
New York, NY 10010
Softcover, 325 pp., $14.95

The most succinct recipe for success that I've ever heard was the advertising slogan used by Kaiser Sand and Gravel a few years back: "Find a need—and fill it!"

Alfred Glossbrenner may have had that piece of advice in mind when he wrote *The Complete Handbook of Personal Computer Communications*; his book fills an almost desperate need for information on home computer telecommunications. In fact, "fills" hardly does the book justice; "fills to overflowing" is more like it. This is that rarest of creations—a book that calls itself complete and very nearly *is*.

The book opens with a chapter on basic technical information, where I finally discovered exactly what a modem does (I've been trying to figure out that one for years). Glossbrenner has the gift of being able to explain things clearly to the novice without losing the experienced user's interest; nowhere is that gift more evident than in this chapter.

The next few chapters cover information utilities (The Source, CompuServe and the Dow Jones News/Retrieval Service). These chapters give detailed instructions on how to use each service, including actual examples and numerous tips on getting the most bang for your bucks. Moreover, they tell you what each service is good for, what kind of information is available, history and plans for the future, cost (and ways to cut it) and the author's recommendation on subscribing (pro or con).

Spock and Databases?

The next section supplies the same sort of information on encyclopedic databases (DIALOG, ORBIT and BRS). This is the big league of databases—the kind of thing you visualize when you see Mr. Spock hold a moonstone up to the light and say "These crystals contain the sum total of all human knowledge!"

Encyclopedic databases aren't quite *that* complete yet, but they can give you information on any doctoral thesis made since 1861, list every book held by the Library of Congress or search through virtually every magazine article published since 1980, looking for references to "shale oil" (to list but three possibilities out of 200 or so).

The next chapters cover BBSs (bulletin board systems), electronic shopping, bartering, banking, teleconferencing and telecommuting. The wealth of information in these chapters is a welcome change from the cursory treatment that these subjects usually receive.

For example, besides telling you how to download free software from a BBS, the book goes on to tell you how to set up a BBS of your own; it also provides tips on how to talk your boss into letting you become a "telecommuter."

The last chapter picks up the technical information where the first one left off, getting deeper into things like parity and translation tables.

There are also several appendixes filled with inside information on Telenet, Tymnet, mailgrams, computerized typesetting and Graphnet (a service that lets you connect your computer into the worldwide Telex network). Lastly, there is an excellent trouble-shooting section that should allow you to cure all but the most stubborn cases of computer flu.

Nobody's Perfect

The book isn't without its faults, however—the most glaring of which is its somewhat erratic organization. The main text is frequently interrupted by what the author calls "on-line tips," which are boxes full of tips and information relevant to the topic under discussion. It's a cute gimmick that is simply overdone; there are so many on-line tips that at times you are left with the disconcerting feeling that you are reading two books simultaneously.

Most of the tips could have, and indeed should have, been incorporated into the main text. Also, the dividing line between chapter and appendix seems rather arbitrary; I got the feeling that at least four of the appendixes were last-minute additions that, given more time, would have been developed as chapters.

Minor criticisms aside, this is one of the most useful books I've run across in a long time. It seems destined to become a classic, and is definitely required reading for anyone interested in getting started in personal computer communications.

Bill Lukeroth
Martinez, CA

Introduction To Assembly Language (Second Edition)

Jon Lindsay
Executive Computing, 1983
PO Box 222178
Carmel, CA 93922
Softcover, 175 pp., $17.98

CP/M Assembly Language Programming

Ken Barbier
Prentice-Hall, 1983
Englewood Cliffs, NJ 07632
Softcover, 226 pp., $12.95

One of the great truths of computer programming is that sooner or later you come up against the need to learn assembly language programming.

Many personal computer users will enjoy long and productive use of their systems without ever having to use anything other than commercially available software. But the person who decides to write a program in, say, Basic, has taken the first step to a fuller understanding of his computer and eventually will want to know how to get the most from the computer.

It goes almost without saying that assembly language is at once the most difficult and the most efficient means of making the computer do what you want it to do. That first look, however, at opcodes, assembler directives and the esoteric documentation manuals that accompanied the computer can be discouraging.

In the good old days of hobby computing, if you had just bought the first Altair on the block, you were into assembly language big time. That was just about all there was six or seven years ago. As a result, there was—and still is—a great thirst for information on how to program in assembly language. Consequently, literally hundreds of books and articles have been published about this arcane art.

In the good old days of hobby computing, if you had just bought the first Altair on the block, you were into assembly language big time. . . . As a result, there was—and still is—a great thirst for information on how to program in assembly language.

Naturally, each microprocessor chip is different in its instruction set and programming technique (except for families of chips, such as Intel's 8080/8085 series), and each generates its own literature, written by its own group of users and proponents.

Probably the most widely-used chip has been the 8080 and its derivitives, since by most estimates more of these microprocessors have been installed in computing and processing devices than any other.

Books on Chips

Until recently, the best books on 8080 programming were the BugBook series by Chris and Jonathan Titus (The Blacksburg Group). This series covers the spectrum, from basic introductory material on digital electronics to interfacing and sophisticated assembly language programming. Indeed, BugBooks 3, 7 and 8 are still required reading for anyone who wants to thoroughly understand all of the subtleties of the 8080 and its supporting family of chips.

However, as packed with information as they are, they are only one step removed from the 8080 bible—the Intel manuals.

Clearly, there is a market for introductory books on the 8080, especially in relation to the most widely used 8080-based operating system, CP/M. Two excellent introductory books dealing with 8080 assembly language have appeared, almost simultaneously, to help fill the gap.

The first of the books I came across was Jon Lindsay's *Introduction to CP/M Assembly Language*. My copy is the second edition, published in 1983. The first edition was published in 1982 (it was reviewed in the February 1983 issue of *Microcomputing*). Lindsay's book includes 16 chapters, seven appendixes, a bibliography and a good index—all in 175 large-format pages.

Lindsay's name is likely to be familiar to readers of microcomputing journals; he's written quite a few useful articles and contributed to the CP/M software library.

CP/M uses 38 function calls to do things like print a string of ASCII characters to the console or read a sector on a disk. Using these function calls is the essence of assembly language programming in a CP/M environment; these functions form the basis of most of the chapters in Lindsay's book.

All too many assembly language programmers seem to feel the need to reinvent the wheel and write their own I/O into their programs, thereby killing almost any chance for portability and obviating the greatest advantage of CP/M—the ability to use with it standard functions that are machine-independent.

Reinforcement

Each of the first seven chapters includes a working example of a small program that uses the CP/M function the author is discussing. The most useful aspect of this approach is that the reader can type in the program, assemble it as shown and run it on his computer. Instant reinforcement!

The same approach is used in each of the next seven chapters, which cover disk files, both sequential and random. This part of the book concentrates on the creation of a program to copy a disk and a simple random access database program.

The last chapters discuss computer logic and gaming techniques, including the use of tables. Tic-Tac-Toe is the teaching vehicle for this lesson. Even if you feel you don't need an assembly language Tic-Tac-Toe game, the use of the functions illustrated makes these two chapters worth reading.

The seven appendixes include the obligatory but handy listings of 8080 opcodes, control characters in decimal and hexadecimal, a list of CP/M functions, a map of the file control block and a listing of ASCII characters.

A trouble-shooting guide for assembly language programs is also included. This is the first example of such a guide that I've come across, and Lindsay has some useful techniques to offer.

Circle 169 on Reader Service card.

PRODUCTS FOR ATARI* 400/800 FROM ELCOMP

BOOKS:

ATARI BASIC – Learning by Using
An excellent book for the beginner. Many short programs and learning exercises. All important features of the ATARI computers are described (screen drawings, special sounds, keys, paddles, joysticks, specialized screen routines, graphics, sound applications, peeks, pokes, and special stuff). Also suggestions are made that challenge you to change and write program routines.
Order #164 **$7.95**

Games for the ATARI Computer
This book describes advanced programming techniques like player-missile-graphics and use of the hardware-registers. Contains many ready to run programs in BASIC and one called GUNFIGHT in machine language.
Order #162 **$7.95**





Programming in 6502 Machine Language on your PET+CBM
2 complete Editor/Assemblers (Source code 3 hexdump + description plus a powerful machine language monitor (Hexdump)).
Order #166 **$19.95**

How to program your ATARI in 6502 machine language
Introduction to machine language for the BASIC programmer
Order #169 **$9.95**

SOFTWARE IN BASIC FOR ATARI

Invoice Writing for Small Business
This program makes writing invoices easy. Store your products in DATA statements with order-number, description, and price. The program later retrives the description and price matching to the entered order-number. The shipping cost and the discount may be calculated automatically depending on the quantity ordered or entered manually. The description to the program tells you how to change the program and adapt it to your own needs. Comes with a couple of invoice forms to write your first invoices on to it.

Order #7201	**cassette version**	**$29.95**
Order #7200	**disk version**	**$39.95**

Mailing List
This menu driven program allows the small business man to keep track of vendors and customers. You can search for a name or address of a certain town or for an address with a certain note. 50 addresses are put into one file.

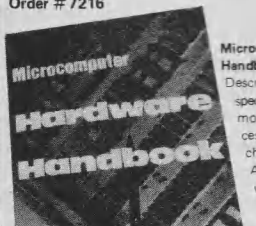
Order #7212	**cassette version**	**$19.95**
Order #7213	**disk version**	**$24.95**

Inventory Control
This program is menu driven. It gives you the following options: read/store data, define items, entry editing, inventory maintenance (incoming-outgoing), reports. The products are stored with inventory number, manufacturer, reorder level, present level, code number, description.

Order #7214	**cassette version**	**$19.95**
Order #7215	**disk version**	**$24.95**

Programs from Book #164
The programs from book no. 164 on cassette. (Book included)
Order #7100 **$29.00**

Game Package
Games on cassette. (Bomber, tennis, smart, cannon fodder, etc.)
Order #7216 **$9.95**



Microcomputer Hardware Handbook (845 pages)
Descriptions, pinouts and specifications of the most popular microprocessors and support chips.
A MUST for the hardware buff.
Order-No. 29
$14.95

Care and Feeding of the Commodore PET
Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order #150 **$9.95**

HOFACKER

Payment: check, money order, VISA, MASTER-CHARGE, Euroscheck.
Orders from outside USA: add 15% shipping. CA residents add 6.5% tax
*ATARI is a registered trademark of ATARI Inc.
*VIC-20 is a registered trademark of Commodore

ELCOMP PUBLISHING, INC
53 Redrock Lane
Pomona, CA 91766
Phone: (714) 623 8314

Books + Software for ATARI VIC-20 OSI SINCLAIR TIMEX

SOFTWARE IN MACHINE LANGUAGE for ATARI

ATMONA-1
This is a machine language monitor that provides you with the most important commands for programming in machine-language. Disassemble, dump (hex and ASCII), change memory location, block transfer, fill memory block, save and load machine-language programs, start programs. Printer option via three different interfaces.

Order #7022	**cassette version**	**$19.95**
Order #7023	**disk version**	**$24.95**
Order #7024	**cartridge version**	**$59,00**

ATMONA-2
This is a tracer (debugger) that lets you explore the ATARI RAM/ROM area. You can stop at previously selected address, opcode, or operand. Also very valuable in understanding the microprocessor. At each stop, all registers of the CPU may be changed. Includes ATMONA-1.

Order #7049	**cassette version**	**$49.95**
Order #7050	**disk version**	**$54.00**

ATMAS
Macro-Assembler for ATARI-800/48k. One of the most powerful editor assemblers on the market. Versatile editor with scrolling. Up to 17k of source-Code. Very fast, translates 5k source-code in about 5 seconds. Source code can be saved on disk or cassette. (Includes ATMONA-1)

Order #7099	**disk version**	**$89.00**
Order #7999	**cartridge version**	**$129.00**

ATAS
Same as ATMAS but without macro-capability. Cassette-based.

Order #7098	**32k RAM**	**$49.95**
Order #7998	**48k RAM**	**$49.95**

ATEXT-1
This wordprocessor is an excellent buy for your money. It features screen oriented editing, scrolling, string search (even nested), left and right margin justification. Over 30 commands. Text can be saved on disk or cassette.

Order #7210	**cassette version**	**$29.95**
Order #7216	**disk version**	**$34.95**
Order #7217	**cartridge version**	**$69.00**

GUNFIGHT
This game (8k machine-language) needs two joysticks. Animation and sound. Two cowboys fight against each other. Comes on a bootable cassette.
Order #7207 **$19.95**

FORTH for the ATARI

FORTH from Elcomp Publishing, Inc. is an extended Fig-Forth-version, Editor and I/O package included. Utility package includes decompiler, sector copy, Hex-dump (ASCII), ATARI Filehandling, total graphic and sound, joystick program and player missile. Extremely powerful!
Order #7055 **disk** **$39.95**

Floating point package with trigonometric functions ($0 - 90^0$).
Order #7230 **disk** **$29.95**

Learn-FORTH from Elcomp Publishing, Inc.
A subset of Fig-Forth for the beginner. On disk (32k RAM) or on cassette (16k RAM).
Order #7053 **$19.95**

Expansion boards for the APPLE II



The Custom Apple + Other Mysteries
A complete guide to customizing the Apple Software und Hardware
Order-No. 680 **$24.95**

We also stock the boards which are used in the book "The Custom Apple . . . " (barebords)

6522 I/O Board No. 605	**$39.00**
EPROM Burner No. 607	**$49.00**
8K EPROM/RAM Board No. 609	**$29.00**
Prototyping board for the Apple II No. 604	**$29.00**
Slot repeater board for the Apple II No. 606	**$49.00**

Order two boards and get the book free !

COMING SOON ! ORDER NOW !

A Look in the future with your ATARI
(Astrology and how to do your own horoscope on the ATARI 800. **Order No. 171** **$9.95**
FORTH on the ATARI – Learning by Using
Order No. 170 **$7.95**

Hardware – ADD–ONS for ATARI

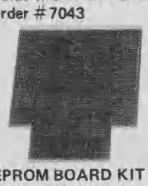
PRINTER INTERFACE
This construction article comes with printed circuit board and software. You can use the EPSON printer without the ATARI printer interface. (Works with gameports 3 and 4).
Order #7211 **$19.95**

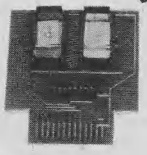
RS-232 Interface for your ATARI 400/800
Software with connector and construction article.
Order #7291 **$19.95**

EPROM BURNER for ATARI 400/800
Works with gameports. No additional power supply needed. Comes compl. assembled with software (2716, 2732, 2532).
Order #7042 **$179.00**

EPROM BURNER for ATARI 400/800 KIT
Printed circuit board incl. Software and extensive construction article.
Order #7292 **$49.00**

EPROM BOARD (CARTRIDGE)
Holds two 4k EPROMs (2532). EPROMs not included.
Order #7043 **$29.95**





EPROM BOARD KIT
Same as above but bare board only with description.
Order #7224 **$14.95**

ATARI, VIC-20, Sinclair, Timex and OSI

New – for your ATARI 400/800

Astrology and Biorythm for ATARI (cass. or disk).
Order #7223 $29.95

Birth control with the ATARI (Knaus Ogino)
Order #7222 cass. or disk $29.95

Books + Software for VIC-20 (requires 3k RAM Exp.)

#4870	Wordprocessor for VIC-20, 8k RAM	$19.95
#4883	Mailing List for VIC-20, 16k RAM	$14.95
#141	Tricks for VICs - The VICstory Progr.	$9.95
#4880	TIC TAC VIC	$9.95
#4881	GAMEPACK I (3 Games)	$14.95
#4885	Dual Joystick Instruction	$9.95

INPUT/OUTPUT Programming with your VIC
Order #4886 $9.95

#4896	Miniassembler for VIC-20	$19.95
#4881	Tennis, Squash, Break	$9.95
#4894	Runfill for VIC	$9.95

Universal Experimenter Board for the VIC-20
(Save money with this great board). This board plugs right into the expansion slot of the VIC-20. The board contains a large prototyping area for your own circuit design and expansion. The construction article shows you how to build your own 3k RAM expander and ROM-board.
Order #4844 **$18.95**

Software for SINCLAIR ZX-81 and TIMEX 1000

#2399	Machine Language Monitor	$9.95
#2398	Mailing List	$19.95

Programming in BASIC and machine language with the ZX-81 (82) or TIMEX 1000.
Order #140 (book) $9.95

Books for OSI

#157	The First Book of Ohio	$7.95
#158	The Second Book of Ohio	$7.95
#159	The Third Book of Ohio	$7.95
#160	The Fourth Book of Ohio	$7.95
#161	The Fifth Book of Ohio	$7.95
#151	8K Microsoft BASIC Ref. Man.	$9.95
#152	Expansion Handbook for 6502 and 6802	$9.95
#153	Microcomputer Appl. Notes	$9.95

Complex Sound Generation
New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.
Order #154 **$6.95**

Small Business Programs Order #156
Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more. Introduction to Business Applications. **$14.90**

The bibliography is short but reasonably complete, which is another way of saying that I agree with his selection of references. The index is also short, but also sufficiently complete.

Another Dandy

Overall, I consider this one of the two best books on assembly language that I've seen. The other is *CP/M Assembly Language Programming* by Ken Barbier, whose name is also a familiar one to those of us who have been reading microcomputer journals for a few years.

Barbier's book represents a somewhat different approach to the problem of assembly language in that he starts from the very beginning. Where Lindsay assumes a general familiarity with computers and CP/M, Barbier spends a good deal of time on the hardware part of the system and the overall operation of CP/M. As a result, more material is covered in its 226 pages, but in possibly less detail than in Lindsay's book.

The first chapter is devoted to hardware and a discussion of what goes on in the system as a whole. For the rank beginner, this is a solid introduction.

Barbier follows up with two chapters on the software part of the system and the idiosyncrasies of the Intel Microcomputer Development System (MDS) naming conventions. Again, this is valuable introductory material.

The next three chapters cover CP/M itself—what it is and how it works. Disk I/O, BDOS, CBIOS and the Console Command Processor (CCP) are discussed in enough detail so that most programmers will never have to refer to those parts of their Digital Research CP/M manuals.

Chapters 7–10 introduce the reader to the actual programming of the 8080 family of chips. Naturally, everything Barbier says about 8080 applies to the 8085 and the Z80, and he carefully points out the differences. Register usage is the secret to efficient programming, and that rates a chapter all itself. Finally, the stack register is covered.

The next four chapters lead the reader through the creation of a library of useful subroutines. This is possibly the most instructive section because it represents an excellent opportunity for the reader to do some writing and testing. When you're through with this section, you'll have a set of usable subroutines that you can build on.

Chapters 15–18 cover disk files, including accessing data, writing data and copy routines. No games here, but Barbier ends this section with a useful copy program called, naturally enough, COPY.COM, which does some of the things that PIP.COM does, but in a more user-friendly way. You may never replace PIP with COPY, but you'll certainly learn some useful programming techniques while you're working with it.

The book ends with two appendixes, the ASCII code and the 8080 instruction set. There's also a thorough index.

Showing Some Style

Barbier's book appealed to me slightly more than Lindsay's because of his excellent style of writing. This, of course, is purely personal preference. I also appreciate his material on CP/M itself since, as a relatively new convert to CP/M, I had a lot to learn about the operating system in which I was going to try to program.

There are fewer programming examples in Barbier's book, but they're longer and work to an integrated whole that I found more immediately useful than in Lindsay's book. Both books are literate and technically accurate—rare commodities in the microcomputer world today.

In comparing these two books, my original intent was to select the one that best serves the beginning assembly language programmer, but I can't do that. Anyone who is truly interested in getting the most from his CP/M computer system and wants to begin the process of learning assembly language would do well to acquire both books.

Any author who wants to improve on the literature of 8080 assembly language programming will have a Herculean task; these two books are almost impossible to better.

D.C. Shoemaker
APO, NY

1984 Computer Desk Diary

Gil Roeder and
Jason A. Shulman
Workman Publishing, 1983
1 W. 39th St.
New York, NY 10018
Spiral-bound, 128 pp., $8.95

A review of a desk calendar?

It's unorthodox, but in the case of the *1984 Computer Desk Diary*, it's not only defensible, but understandable. This weekly organizer of a book serves not only as a day-to-day reminding tool, but as a minicourse in the history of computing.

Each double-page spread in the book offers a week's worth of space for notes along with a photo and caption describing an important event in computer history. Anniversaries of significant events are marked as well.

The photos and captions featured in each spread make for a valuable textbook in summary. The facts provided are interesting in almost every case.

For instance, you'll find a short piece on the Gore sorter, which is not a directory of horror movies, but a method invented in the late 19th century by John Gore to place information from several ledger sheets onto a single punch card (which in turn could be sorted by another machine).

The origin of the Goto statement is also explained; the Countess of Lovelace (Augusta Ada Lovelace, 1815–1854), who was poet Lord Byron's daughter, is notorious for being the first programmer and for coming up with the Goto statement.

The *1984 Computer Desk Diary* also provides some priceless photos—such as one of the ancient-looking "Apple-1 Operation Manual," another of the single-board Apple I computer and still another of IBM's first (and quite modest) headquarters in Endicott, NY.

You'll find summaries of the origins behind everything from micro lasers, synthesizers and Videotext to John Von Neumann's stored program concept, the 1956 creation of the first analog computer kit (from the company founded by Edward Heath in the 1920s) and Maurice Wilkes' work on EDSAC.

And just so you'll remember to send out cards, the *1984 Computer Desk Diary* offers reminders of important dates, including the birthdays of Apple Computer (January 3, 1977), the Sinclair ZX-80 (January 29, 1980), IBM founder Thomas J. Watson, Sr. (February 17, 1874), Computerworld (June 12, 1967), VisiCalc programmer Robert Frankston (June 14, 1949), Blaise Pascal (June 19, 1623), Atari (June 29, 1972), the IBM PC (August 14, 1981) and CompuServe (September 24, 1979).

For a nice touch, the authors close the book with quick reference guides to VisiCalc, CP/M and WordStar, as well as an ASCII code table and a calendar of 1984 computer events.

Larry Canale
Microcomputing

From the MC Bookshelf

In these days of mass-produced computer books, anyone looking for complete, well-organized and professionally produced guides to just about any system should have no trouble finding help.

One company that seems to have a firm grasp on introductory guide publishing is Weber Systems, Inc. (8427 Mayfield Road, Cleveland, OH 44026). Weber Systems' neatly designed series of books not only can pull beginners through the basics of their machines, but they can serve as reference manuals for intermediate and advanced users.

Five of the titles in Weber Systems' classy series are:

- *Commodore-64 User's Handbook* (WSI staff; softcover, 307 pp., $14.95).
- *User's Handbook to the TRS-80 Model II Computer* (Jeffrey Weber; softcover, 303 pp., $13.95).

● *User's Handbook to the VIC-20 Computer* (J. Weber and Stephen Szczecinski; softcover, 278 pp., $13.95).

● *Kaypro User's Handbook* (WSI staff; softcover, 309 pp., $14.95).

● *User's Handbook to the Atari 400/800 Computer* (J. Weber and S. Szczecinski; softcover, 319 pp., $13.95).

Each of the releases includes introductory material, chapters on the installation and operation of the particular machine and information on special features and peripherals. The books, however, don't follow a set, contrived pattern; the authors strive to avoid monotonous routines—as they should.

For instance, in *User's Handbook to the TRS-80 Model II Computer*, Weber provides an interesting history of Radio Shack's machines, including brief biographies of the Model I, III, 16, the Color Computer and the Pocket Computer. In addition, he offers in-depth coverage of TRSDOS.

The Commodore-64, VIC-20 and Atari books include detailed sections on sound and graphics capabilities. And the *Kaypro User's Handbook* offers entire chapters on the software programs that come with the machine.

Weber Systems has also released books on the Apple II, the TI 99/4A, the Compaq, the Coleco Adam and Lotus 1-2-3.

New and Noted

Several other companies have released comprehensive guides for users of different machines.

From Osborne/McGraw-Hill (2600 Tenth St., Berkeley, CA 94710) come *Your Commodore-64: A Guide to the Commodore-64 Computer* (John Heilborn and Ran Talbott; softcover, 444 pp., $14.95), a thorough and attractive manual for beginners and experienced C-64 users, and *The ZX-81/TS/1000 Home Computer Book* (David Foyt; softcover, 307 pp., $7.95), a hands-on guide geared toward the novice.

Osborne/McGraw-Hill has also released *Your IBM PC: A Guide to the IBM Personal Computer* (Lyle Graham; softcover, 580 pp., $16.95), which features descriptions of CP/M-86 and PC DOS.

Other easy-to-read, attractively packaged books that serve as reference guides on specific systems include:

● *An Introduction to the Commodore-64: Adventures in Programming*, by Nevin Scrimshaw and James Vogel (from Birkhauser Boston, Inc., 380 Green St., Cambridge, MA 02139; softcover, 124 pp., $11.95).

● *Your Color Computer*, by Doug Mosher (from Sybex, 2344 Sixth St., Berkeley, CA 94710; softcover, 342 pp., $12.95).

● *How to Use the Timex/Sinclair*, by Jerry Willis and Deborrah Willis (from dilithium Press, PO Box 606, Beaverton, OR 97075; softcover, 124 pp., $3.95).

L.C.

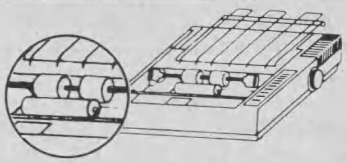
Circle 112 on Reader Service card.

GOOD NEWS FOR EPSON MX-80 and RX-80 OWNERS

MICRO-GRIP FRICTION FEED

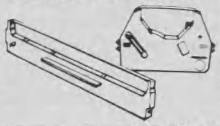
Add inexpensive friction feed to your MX-80 or RX-80. Easily installed with screwdriver, no soldering. Does not disturb tractor feed. Also fits printers based on Epson design such as IBM PC, Commodore and H-P Dot Matrix printers.

Wt. 1 lb. ONLY $39.95/ea.



CARTRIDGE RIBBONS FOR . . .

EPSON MX 70/80	$5.00/ea.	RS LP III, V	$5.85/ea.
EPSON MX 100	9.75/ea.	RS LP VI, VIII	7.00/ea.
RS Daisy Wheel II M/S	5.75/ea.	RS DMP 400	5.50/ea.
RS LP I, IV (Zip Pack)	2.75/ea.	DIABLO Hytype II M/S	4.50/ea.
RS LP I, II, IV (Cart.)	5.85/ea.	OKIDATA 84	5.00/ea.



PRESSURE SENSITIVE LABELS

ONE ACROSS 3-1/2" x 15/16"
ONLY $2.70/M
Order in increments of 5,000

COMPUTER PAPER
MINI PACKS

9-1/2" x 11" Blank, 20 lb. 1 pt., 1000/ctn.
(Extra fine perforations r. & l.) **ONLY $16.25/ctn.**
14-7/8" x 11" 1/2" Green Bar, 15 lb. 1 pt., 1500/ctn.
ONLY $25.00/ctn.

STANDARD PACKAGING

9-1/2" x 11" Blank, 15 lb. 1 pt. 3300/ctn. **ONLY $26.00/ctn.**
14-7/8" x 11" 1/2" Green Bar, 15 lb. 1 pt., 3500/ctn.
ONLY $40.00/ctn.

ALL COMPUTER SUPPLIES AT DISCOUNT PRICES

TERMS AND CONDITIONS

We require a minimum order of $10.00, not including shipping charges. Prices effective 7/1/83 and subject to change without notice. To keep prices competitive we operate on cash basis. Credit extended to Federal agencies, but all other institutions and individuals send payment with order; our prices DO NOT include shipping. No C.O.D. orders accepted. We ship via UPS or motor freight. Include street address, we don't ship to P.O. boxes. Freight charges added to credit card purchases. No merchandise returned without prior written authorization from us. Merchandise ordered in error or not wanted is subject to 25% restocking charge and limited to merchandise credit only.

Send for our Free Brochure of Computer Supplies. Ask for Catalog No. DP-50.

BILL COLE ENTERPRISES, INC.
P.O. BOX 60 • DEPT. MC WOLLASTON, MA 02170-0060 617-963-5510
For Credit Card Orders ONLY! Call Toll Free 1-800-225-8249

Now Available THE ORIGINAL CREATOR ™
by Bruce Tonkin

The CREATOR is a sophisticated, but easy to use data base program generator. It writes in BASIC code but you talk to it in simple English. Thousands of copies already sold and operated by happy users. Excellent for mail lists, accounts receivable, accounts payable, check writers, and the list goes on and on. But don't be fooled, the CREATOR is only limited by your imagination.

The CREATOR can help make you a real pro. Based on your ideas, it writes complete standalone programs. If you wish, you may even sell the programs you generate and owe NO royalties.

The CREATOR is available for:

- Radio Shack I, II, III, IV
- IBM PC, PC-XT
- Osborne 1, Osborne Executive
- Kaypro II
- LNW-80
- Morrow Micro Decision
- NEC PC 8001 Alpha
- Omikron Mapper
- Holmes Vid-80
- Compaq, Corona, Columbia
- Apple II, II+, IIe*
- Xerox 820-1, 820-2
- IBM PC CP/M-86
- Zenith H-89, Z-100
- Eagle
- Cromemco Z-2
- Lobo Max 80
- Access Matrix
- Memory Merchant Shuffle Board
- Hyperion
- Hurricane Compactor I, II

All brands are registered Trademarks

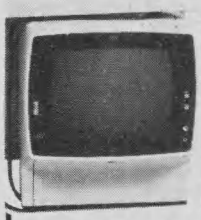
The CREATOR includes free the Reporter and complete documentation.
Price: ~~$59.95~~ Special Offer: **$39.95**

Send check or money order along with $1.50 postage to:
Rio Grande Software
P.O. Box 77
West Liberty, IA 52776
319-627-2272

*Requires CP/M 2.2

Circle 15 on Reader Service card.





Learn how to Program and Use PERSONAL COMPUTERS

Now at Home in Spare Time, you can learn everything you always wanted to know about personal computers. How to program in BASIC. How to understand and use more than 80 BASIC commands and functions. How to write and run your own programs... for both personal and business applications. How to use pre-packaged software and change it to meet your special needs. How to make sense of the overwhelming maze of books, information and advice available at your local computer store.

More Than Just A Computer Manual

This is more than just another programming manual...it's an entire comprehensive course written by experts. Yet, because it was especially developed for home study, you learn everything right in your own home, without changing your job or lifestyle, without attending a single class.

Plus You Get Your Own Computer

To give you practical hands-on experience, this course includes your own personal computer—the Timex Sinclair 1500 with built in 16K memory—plus a cassette recorder that lets you save your programs on tape.



Get all the facts. MAIL COUPON TODAY!

ICS SINCE 1891 **COMPUTER TRAINING**, Dept. DL014
Scranton, PA 18515

Name _____ Age ____
Address _____
City/State/Zip _____

CALENDAR

Astrohall Computer Exposition—Texas

The PC World Exposition will be held on February 1–3 in Houston's Astrohall. The show is for both buyers and sellers of IBM PC products.

Software, peripherals, compatibles and other accessories relevant to the PC will be on display.

For more information, contact Karen Bartnicki at 617-879-6917.

A Sage Event

Sage Computer is sponsoring Sage Faire '84 on February 3–5. The event will be held in the MGM Grand Hotel in Reno, NV.

Sage users, dealers and software marketers are all invited. Technical seminars will run concurrently, and members of USUS, the p-system user's group, plan to hold an interim meeting at the show.

For more information, call or write Sage Computer, 4905 Energy Way, Reno, NV 89502; 702-322-6868.

Computers in the Cocoanut Grove

The second annual Santa Cruz Computer Festival will be held February 3–5 at the Cocoanut Grove on the Santa Cruz Boardwalk. February 3's program will focus on business and agricultural uses of the computer and February 4's schedule will address educators.

Both days will feature displays, demonstrations and workshops. Seminars will discuss the computer job market and offer guidelines on purchasing systems. For more information call Judy Immerman at 408-425-1503.

Yankee Gatherings

The Yankee Group will hold two IBM seminars in February. The New York show will be on February 7 and 8 and the San Francisco show is scheduled for February 14 and 15.

For more information, write or call Lisa Caruso, Seminar Director, 89 Board St., Boston, MA 02110; 617-542-0100.

Computers in the City of Brotherly Love

The Association for Computing Machinery Computer Science Conference will be held February 14–16 in Philadelphia, PA.

The finals of the International Student Programming Contest will round out the agenda. For more information, contact Social and Ethical Implications of Computers.

The finals of the International Student Programming Contests will round out the agenda. For more information, contact Dr. Frank Friedman, Conference Chairman, Computer and Information Science Department, Temple University, Philadelphia, PA 19122; 215-787-1912.

Sunshine and Computers

Computer Expo '84 will be held February 17–19 in Orlando, FL. The show will feature leading hardware and software vendors.

Several seminars and workshops are also planned. For more information, contact Laurel Netzer, PO Box 3435, Longwood, FL 32750; 305-862-6917.

ICCs in the European Theater

The European Spring Series of the Invitational Computer Conference kicks off in Stockholm, Sweden, on February 21. The ICCs are one-day, by-invitation-only conferences directed at a select audience of volume buyers. Each show features displays of operating equipment and technical seminars.

Paris will host an ICC on February 23 and Munich, West Germany, is the site of a show on February 28. For more information, write or call B.J. Johnson and Associates, 3151 Airway Ave., #C-2, Costa Mesa, CA 92626; 714-957-0171.

Softcon Hits the Jazz City

Softcon, billed as the largest first year trade show, is scheduled for February 21–23 at the Superdome in New Orleans, LA. The trade-only show is geared specifically toward the software industry.

Nearly 1800 exhibits are slated and more than 100 seminars, discussions, conferences and workshops will also be held.

More information is available from Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; 800-841-7000, or, from within Massachusetts, 617-739-2000.

Leisuretronics at Monte Carlo

An international congress and exposition for the electronic games industry is scheduled for February 21–24 in Monte Carlo, Monaco.

Leisuretronics '84: Applications, Implications and Future Opportunities is aimed at those involved in home, arcade and stand-alone electronic games and software.

Seventeen countries will be represented. Papers will be presented on a variety of topics and a trade show will round out the proceedings. For more information, contact Robert DeStefano, 294 Main St., East Greenwich, RI 02818; 800-556-6882.

IIE Seminars Continue in Atlanta

The Institute of Industrial Engineers continues its seminar program in February with the Effective Utilization of Microcomputers for the IE conference on February 23 and 24.

Noted computer specialist Gary Whitehouse is scheduled to speak to participants. For registration information, contact the IIE Conference Department, 25 Technology Park/Atlanta, Norcross, GA 30092; 404-449-0460.

Computer Consumption in California

The Computer Supermarket personal computer show is scheduled for February 25 and 26 at the San Mateo Fair Grounds in San Mateo, CA.

Computer retailers, manufacturers and distributors will offer substantial savings on a variety of personal computer products. For more information, call or write Microshows, PO Box 432, Foster City, CA 94404; 415-571-8041.

Computers in Education—San Francisco

On February 25 and 26, San Francisco, CA, will host the second annual Western States Conference: Computers and Reading/Learning Difficulties. Teachers and reading and learning disability specialists will discuss using the computer in reading, learning and language arts training.

Special discount rates are available for school districts. Write the Educational Computer Conference at Department N, 1070 Crows Nest Way, Richmond, CA 94083 for more information.

The Microcomputing Jungle—Kansas

The University of Kansas has announced that a two-day conference, The Microcomputing Jungle: Impact on Health Care, will be offered March 1 and 2.

The course will address the problems of computerizing medical offices and the implications of a national information network. University credit is available.

For more information, contact Jan Johnson at the office of Continuing Education, University of Kansas Medical Center, 39th and Rainbow, Kansas City, KS 66103; 913-588-4480.

BizCom as Usual in New Hampshire

On March 9–11, Manchester, NH, will host BizCom '84, a business equipment and computer show. Business and personal computer vendors, software companies and peripheral marketers will be represented.

Contact Joan Shea for more information at BizCom '84, 115 Front St., Manchester, NH 03102.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classified *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ads as it may be delayed.

LOWEST POSSIBLE PRICES
ANYWHERE!
Computers (Hardware-Software-Printers),
AUDIO (Most Major Brands),
Video Recorders-Car Stereo-Televisions-
Major Appliances-ALL NEW-Fully
Warranteed!
MC/VISA-ELECTRIFIED
DISCOUNTERS.
996 Orange Ave., West Haven, CT 06516
203-937-0108

The Egyptian Management Information Center, 93 Kasr Eleiny St., Cairo, Egypt, phone 27525, telex 92185, Hapi Un, is looking for interested manufacturers to market their hardware and software in Egypt and the Middle East. Contact Adel Fahmy, Ph.D.

DEALER DIRECTORY

Aurora, IL

Full line of Apple Computer and Fortune Computer, Hewlett-Packard Personal Computers, Calculators and Supplies. IDS Prism, SMC and Daisywriter Printers. **Farnsworth Computer Center, 1891 North Farnsworth Ave., Aurora, IL 60505 (851-3888) and 383 East North Ave., Villa Park, IL 60181 (833-7100).**

Nokomis, FL

We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, PO Box 130, Nokomis, FL 33555. 484-0421.**

Dealers: Listings are $15 per month in prepaid quarterly payments, or one yearly payment of $150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.



Circle 309 on Reader Service card.



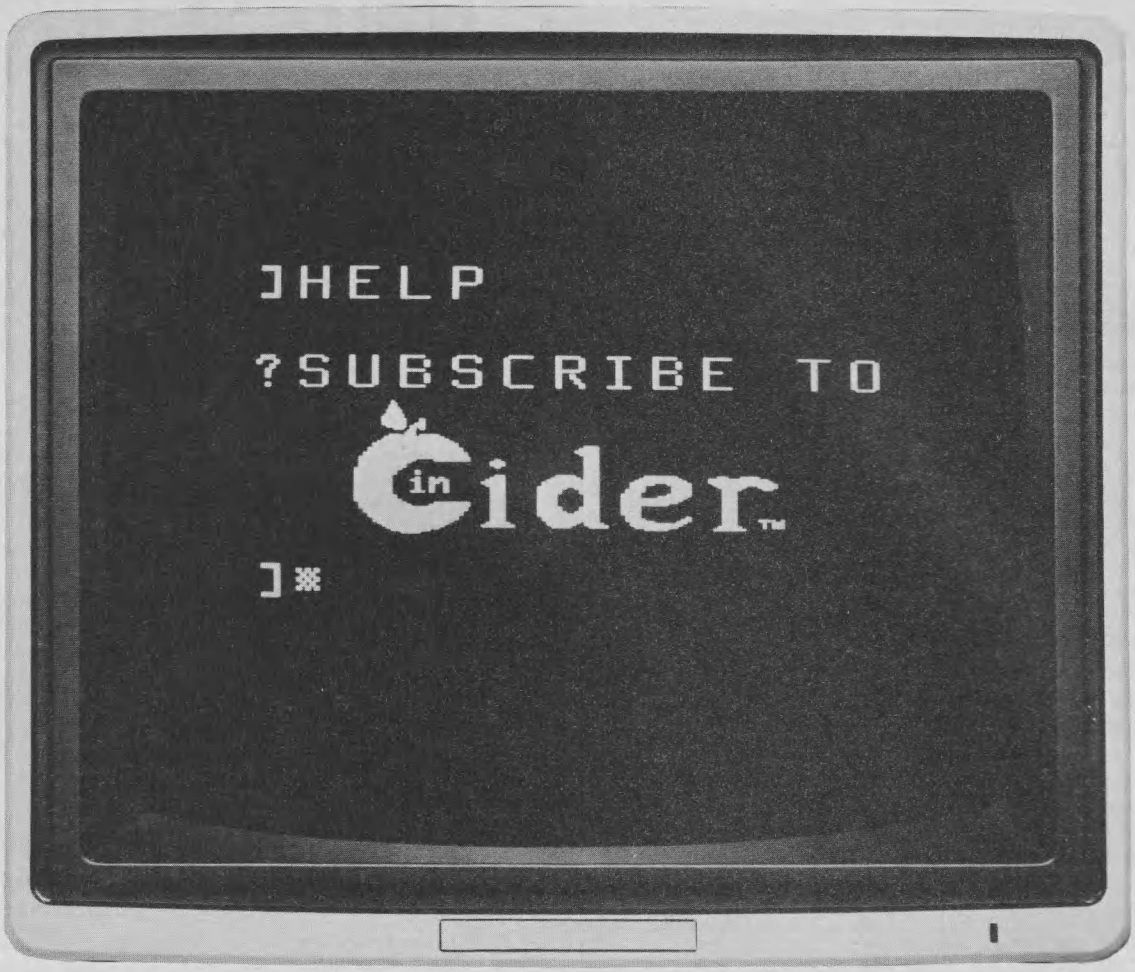
Precision Data Products
P.O. Box 8332
Grand Rapids, MI 49508-0332
Outside U.S.A. (616) 452-3457
Michigan 1-800-632-2468
Outside Michigan 1-800-258-0028

3M Brand Diskettes @ Our Prices + Toll-Free Ordering = Error Free Performance

VISA **Precision Data's Prices** MasterCard

8" Diskette	Per Diskette (Orders of 50 or more)
Single Sided - Single Density - Soft Sector	
SS - SD Storage Box	$1.99
SS - SD Bulk with Envelope No 3M Logo	1.90
Single Sided - Double Density - Hard or Soft Sector	
SS - DD Storage Box	2.59
Double Sided - Double Density - Soft or 32 Hard Sector	
DS - DD Storage Box	3.39
5¼" Diskette	
Single Sided - Double Density - Soft or Hard Sector	
SS - DD - RH Storage Box	1.89
SS - DD - RH Bulk with Envelope No 3M Logo	1.80
SS - DD - 96 TPI - RH Storage Box	2.85
Double Sided - Double Density - Soft or Hard Sector	
DS - DD - RH Storage Box	2.79
DS - DD - RH Bulk with Envelope No 3M Logo	2.70
DS - DD - 96 TPI - RH Storage Box	3.80
Apple Fileware Compatible	4.49
Certified Data Cartridges	
DC 100A	13.50
DC 300XL	20.65

Shipping & Handling $3.00/50 DiskettesSurcharge of 10% for quantities less than 50 Diskettes



Now you can get all the help you need to improve your Apple* computing skills...in one place. **inCider** gives you more *practical* information on Apple products and programming than any other source. Every issue covers the field for you with these instructive columns:

- *The Applesoft Adviser* discloses the subtleties of programming in Applesoft Basic.
- *The Assembly Advantage* reveals the power of Assembly language programming.
- *Bent on Business* explains the best ways to increase office productivity with your Apple.
- *Fudge It!* shows you how to add eye-catching color, hi-res, and sprite graphics to your print-outs and games.
- *Interaction—A Child's World* gives you fun programs to introduce your children to computing.
- *III's Company* unlocks the hardware & software secrets of the Apple III.
- *Hints 'n' Techniques* offers affordable solutions to everyday computing problems.

That's not all. Every month over a dozen easy-to-understand articles bring you the latest hardware projects, utilities, applications, games, and Pascal & Logo programs & tips. Now you can:

- make every purchase a sound investment with the candid buyer's guides and product reviews.
- use the colorful ads to comparison-shop from home.
- read about new products before they reach the stores.

With all this at your fingertips, you could save the cost of your subscription with one wise purchase.

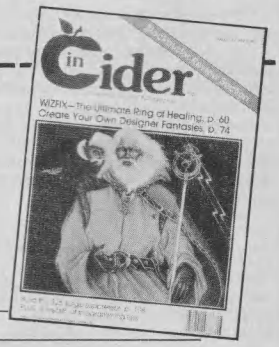
And your subscription to **inCider** is risk-free. If you don't like your first issue, just write "cancel" across the invoice and return it to us. You won't owe a thing.

Subscribe to **inCider** today. A full year is only $24.97. Fill out the coupon below or the attached order card right now, and return it to: **inCider** Subscription Department, PO Box 911, Farmingdale NY 11737. For even faster service, call toll free:

1 (800) 258-5473

*In New Hampshire call 1-924-9471. Get a 13th issue **FREE** when you enclose payment or charge it on your Mastercard, Visa, or American Express.*

**Apple is a registered trademark of Apple Computer Inc.*



ENTER my subscription to **inCider** for one year at $24.97. I understand that with payment enclosed or credit card order I will receive a **FREE** issue, making a total of 13 issues for $24.97. *This offer voids all previous offers.*

☐ Check enclosed ☐ MC ☐ VISA ☐ AE ☐ Bill me

Card # _____ Exp. date_____

Signature _____

Name _____

Address _____

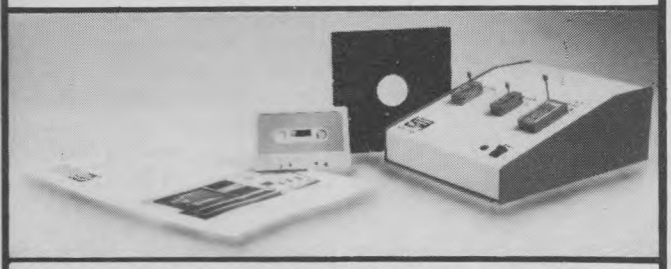
City_____ State_____ Zip_____

Canada and Mexico $27.97, 1 year only, US funds drawn on US bank. Foreign surface $44.97, 1 year only, US funds drawn on US bank. Please allow 6-8 weeks for delivery. Foreign airmail please inquire.

inCider® • PO Box 911 • Farmingdale, NY 11737 342F7

Circle 191 on Reader Service card.

AFFORDABLE PROM EPROM PROGRAMMING !!!



Until now the purchase of programming equipment cost thousands of dollars. That is until now! If you can afford a Radio Shack Model III or IV you can afford a PROM/EPROM programmer! Riverlake Systems Inc. has introduced the model EP-10 PROM/EPROM programmer that connects directly to the Model III or IV 50 pin bus and programs the popular PROM types 82S23/123, 82S126/129, and 82S130/131 ALSO EPROM types 2758, 2716, 2732, 2732A, and 2764. The EP-10 comes complete with menu driven single key command software. Since we're always updating the capability send for a complete list of device capability.

$384.95

Riverlake Systems Inc.

RIVERLAKE SYSTEMS, INC.
P. O. BOX 1927
ROSWELL, GA. 30077
404-475-0028

Radio Shack™ and TRS-80™ are trademarks of Tandy Corp.

Circle 392 on Reader Service card.

WANTED

"Buyers" & "We'll pay the shippin'

•CALL FREE (800) 654-4058•

"Call For Reduced Prices At Various Quantities"

Verbatim		Dysan CORPORATION		3M Scotch®	
5¼" sin·side dbl·den.	2.40	5¼" sin·side dbl·den.	3.20	5¼" sin·side dbl·den.	2.20
5¼" dbl·side dbl·den.	3.45	5¼" dbl·side dbl·den.	4.20	5¼" dbl·side dbl·den.	3.20
5¼" sin·side quad	3.20	5¼" sin·side quad	4.45	8" sin·side sin·den.	2.35
5¼" dbl·side quad	4.40	5¼" dbl·side quad	4.95	8" sin·side dbl·den.	2.95
8" sin·side sin·den.	2.75	8" sin·side sin·den.	3.45	8" dbl·side dbl·den.	3.90
8" sin·side dbl·den.	3.05	8" sin·side dbl·den.	4.45		
8" dbl·side dbl·den.	3.40	8" dbl·side dbl·den.	4.95		

Head Cleaning Kits.... 5.20
Refills. 9.55

We Stock "Bulk-Packed" Diskettes

Disk Minder
- Smoked Plastic
- Holds 75 Disks

17.95 ea

Prices per ea. 10 per box

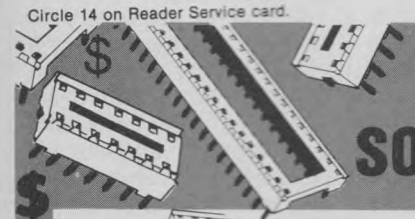
Dealer Inquiries Welcomed

the Diskette Connection™
P.O. Box 1674
Bethany, OK. 73008

MasterCard VISA

*(Continental U.S. only. Add 3.00 on orders under 40.00)

Circle 14 on Reader Service card.



FREE SOCKETS!

Send $1.00 postage and handling for DIP Socket Deal!

One each of 8, 14, 16, 24 and 40 pin tin low profile DIP Sockets

plus

we will send you FREE our 56 page catalog with $1.00 OFF Coupon on any purchase.

How can you lose?

SINTEC COMPANY
28 8th Street
Box 410
Frenchtown, NJ 08825
(201) 996-4093

We Carry Over 1500 Parts in Stock!!

Fill in below for Socket Deal

☐ I want the Socket Deal Enclosed is my $1.00 cash.

Name _____

Address _____

City _____ State _____ Zip _____

Circle 189 on Reader Service card.

TRS-80*

100% Radio Shack Equipment

SAVE A BUNDLE

Order Toll Free 1-800-874-1551
FLA Residents 904-438-6507 collect

EPSON, OKIDATA, CITOH,
TABCO Printer Switches

H & B SALES CO.

704 W Michigan Ave;
P.O. Box 8098
Pensacola, FLA 32505

*TRS-80 is a trademark of Tandy Corporation

NEW SOFTWARE

Edited by Sheila Wright

Client Write-up

Client Write-up is a sophisticated multicompany, multidepartment general ledger program from Micronetics, Inc.

The software is available under MS DOS for the IBM PC and XT, Victor 9000, Wang PC and computers that support MS DOS 2.0. Both floppy and hard disk systems are supported under MS DOS.

When you use a networked computer system, multi-user capability is also available under MS DOS as well as MP/M for Z80-based systems.

Client Write-up allows professional and nonaccounting personnel to enter transactions easily and to print or display all reports. The software maintains an entire 13-month detail, permits adjustments to be made to any period and generates financial reports for any period at any time.

With compiled programs and a file structure that allows instantaneous access to any record, transactions can be entered and financial reports printed within minutes.

The package will run on any MS DOS 2.0, CP/M, MP/M, CP/M-86, MP/M-86, Turbo-DOS or Unix system with a minimum memory of 48Kb and disk storage of 241Kb.

Client Write-up is priced at $14.95 from Micronetics, Inc., 1926 Hollywood Blvd., Hollywood, FL 33020. Reader Service number 460.

Kaypro to Mainframes and Minis

KayLink, comprised of a new software product and minor hardware modifications, allows Kaypro models II, 4 and 10 to communicate with most industry mainframe and minicomputers.

The package will operate with larger computers manufactured by such companies as IBM, Burroughs, Control Data, Cray, Harris, Digital Equipment Corp., Tandem and Modcomp.

KayLink provides Kaypro operators with communication capabilities to any system supporting the HASP protocol. It is fully menu-driven and includes extensive help screens, a high level of security with hidden password protection and the capability to direct data files to disk, printer, console or any combination of the three.

In addition, KayLink includes a modification to Kaypro's asynchronous communication port to provide synchronous capabilities. The package comes with a copy of the communications software and complete documentation.

KayLink is priced at $750 from Kaypro Corp., 533 Stevens Ave., Solana Beach, CA 92075. Reader Service number 462.

Molecular's Atom

Molecular Computer's Atom (Application Tools for Office Management) is an integrated office management software package for its family of CP/M-compatible, multi-user business systems.

Atom consists of an integrated menu system, Molecular's m/Word word processor, m/Calc spreadsheet and an m/Mail package. All packages function together as a unit and share a comprehensive set of menus, a common interface, a help facility and system manager functions.

The product is designed to allow other standard packages, supplied by outside vendors, to be integrated easily into the system with its automatic installation function. This permits endless system expansion.

Atom provides consistency of commands in a mixed terminal environment, supporting such terminals as the Molecular MT-100 (Wyse WY-100), Televideo 91x, 92x and 95x, Adds Viewpoint, DEC VT-100 and ADM-31.

Atom's menu management system consists of a main menu that accesses a series of submenus. Submenus perform specific functions such as word processing, electronic mailing and file utilities.

The m/Word features simple function key commands that replace many control key sequences and also can emulate the majority of WordStar commands. It also provides advanced formatting and features such as on-screen multiple windowing, which allows multiple files to be displayed and edited simultaneously. m/Word also has soft function keys, which allow the flexible assignment of functions, and an abbreviation dictionary, which "spells out" user-designated abbreviations.

The electronic mail facility, m/Mail, allows you to send messages and data files between users within a single Molecular system. A networking option allows users in both local and remote locations and multiple Molecular systems to communicate.

The expected list price for Atom is approximately $1400, including complete installation and documentation. It is manufactured by Molecular Computer, 251 River Oaks Parkway, San Jose, CA 95134. Reader Service number 463.

Make Your IBM an Intelligent Terminal

Interactive Systems' Intext II Emulator is a software package that allows the IBM PC to act as an intelligent terminal for the company's enhanced versions of the Unix operating system.

The software is designed for PC users who want a single device for performing normal IBM PC functions. The software will also communicate with Interactive's Unix-based editor, Ined, Interactive's Unix-based Advanced Productivity System, DEC VMS software and most public computer networks.

Intext II Emulator runs under PC DOS on any IBM PC or XT with at least 64Kb of memory, one disk drive, a color or black and white monitor and an asynchronous communication card.

With the emulator, the IBM PC can also function as a VT100 or VT52, so that it can access the larger body of sophisticated screen software that has been developed for these devices. It can also function as a standard "dumb" terminal to access asynchronous communications networks.

Intext II Emulator is available at a unit price of $475. It is manufactured by Interactive Systems Corp., 1212 Seventh St., Santa Monica, CA 90401. Reader Service number 464.

EMU Dashes for IBM

EMU, from Rhintek, Inc., is a comprehensive software package that runs on the IBM PC, XT and PC-compatible computers to emulate the Data General series of terminals.

The package consists of assembly language software that bypasses the DOS and BIOS calls to achieve true 9600 bps terminal emulation. It is designed for direct-connect applications and can be

used in remote dial-up systems.

EMU can transfer data to and from any PC DOS file, as well as onto a different disk and through a complicated subdirectory structure. It can support between 50 and 9600 bits per second available in the asynchronous communications hardware.

The software comes on a noncopy-protected disk to allow you to move the package to a fixed disk and make back-up copies for protection and archival purposes. The binary license to use this software on one machine costs $95. A source code is available to those who need to make their own custom modifications.

EMU is manufactured by Rhintek, Inc., PO Box 220, Columbia, MD 21045. Reader Service number 465.

Tax Preparation For MultiPlan Operators

Tax-Prep is a personal income tax preparation system designed for operators of the MultiPlan interactive spreadsheet.

The package comes with 19 income tax forms and schedules, reflecting all new 1983 tax laws and IRS regulations. It is available for 64Kb memory micros from A to Z—from Apple (II II Plus and IIe) to Zenith (Z-100)—including IBM PC, XT, PC-compatibles, and Texas Instruments machines.

Tax-Prep has an automatic tax preparation feature that uses visual displays to simulate IRS forms as working templates. Using a "template-linking" method, all of the information that has been entered into the system is automatically applied to the appropriate form and schedule.

In addition to the standard Form 1040 and schedules A, B, C, D, E, G, R, RP, SE and W, Tax-Prep also includes templates for forms 2106, 2119, 2210, 2440, 2441, 3903, 4684 and 6251. The software prints directly onto IRS 1040 forms and schedules.

A comprehensive manual and tutorial are provided in the package. Annual updating is also available.

Tax-Prep costs $89.95 from EZ Ware, Inc., 17 Bryn Mawr Ave., Bala Cynwyd, PA 19004. Reader Service number 466.

Tax Relief for IBM Users

Micro Vision's Tax Relief I and II are professional tax packages for the IBM PC and XT.

Tax Relief II supports 25 schedules and forms, including Form 1040, all lettered schedules and forms 2106, 2119, 2441, 3468, 3903, 4562, 4625, 4797, 4972, 5695 and 6251. Supplemental schedules of depreciation are generated for schedules C, E and F.

Income averaging, minimum tax and alternate minimum tax are calculated automatically. Data and calculations are carried over to relevant places to eliminate duplication of data entry. Most percentage and other limitations, including excess FICA and earned income credit, are checked.

A summary of clients' tax returns is provided for quick reference and tax planning. A client directory that contains a complete record of all the prepared returns is maintained.

Tax Relief II uses a simple data entry method that features an easy-to-read screen layout and on-line help. Input forms are supplied with the package and correspond exactly to the screen format.

Tax Relief II provides several options for printing, including printing on IRS forms and blank computer paper for use of overlays and batch printing.

The software requires an IBM PC or XT with 128Kb of memory, DOS 2.0, two disk drives, monochrome or color display and a parallel printer. It is priced at $299.

Tax Relief I is designed for individual use. It supports 15 of the most commonly used schedules and forms. All of Tax Relief II's features that are relevant to individuals have been included. On-line help refers you to the appropriate IRS publication for further information. Tax Relief I is priced at $149.

Both packages are manufactured by Micro Vision, 145 Wicks Road, Commack, NY 11725. Reader Service number 467.

Advanced DB Master

Stoneware's Advanced DB Master is an information management software for the IBM PC, XT and PC-compatibles. This computerized filing system allows you to store, search, restructure and calculate information and then print out customized reports quickly and efficiently.

One file can span up to 44 floppy disks. This gives the file a capacity of 16 million characters or the equivalent of 4000 pages of unique information storage.

Other advanced features include keystroke macros, text editing and merging, computed fields, user-defined reports, dynamic value tables, array searches, audit trails, screen forms, browse mode, required fields, error prevention, a print buffer and data exchange with other programs as well as with other computers.

Advanced DB Master comes with a manual and is priced at $595. It is manufactured by Stoneware, Inc., 50 Belvedere St., San Rafael, CA 94901. Reader Service number 469.

Apple Has the Write Away

Write Away is a full-feature word processing system that has been enhanced to take advantage of electronic mail.

Write Away creates, edits, prints and transmits documents. With standard word processing features, Write Away also includes form letter and mailing list support, logical operators and conditional text features, "soft" hyphenation, database file reading (including pfs and DB Master files), block move or copy, automatic window line avoidance and other features. A transparency feature allows Write Away to utilize the features of all printers.

A complete terminal communication program has been fully integrated into the Write Away system.

Write Away automatically recognizes the Videx Videoterm and Ultraterm boards, the ALS Smarterm and Smarterm II (all versions), the Wesper Microsystems Wizard 80, the Applied Engineering Videomaster 80, the M & R Sup 'R Module, the Quadram 80-column boards and STB's STB-80.

Write Away supports many interface boards, including the Pkaso Parallel Graphics board, Prometheus Versacard



Stoneware's new Advanced DB Master for the IBM PC and XT and all compatible computers.

and Apple Centronics parallel cards (including buffer cards).

Documentation includes both on-screen and written tutorials that enable you to become proficient with basic word processing functions in less than two hours. The manual is supported by a 14-page index with extensive cross-referencing.

Write Away comes ready-to-run on hard disks and creates ordinary text files that can be loaded into a 28Kb-plus buffer. It requires an Apple II or Apple II Plus with 48Kb of memory or an Apple IIe, and one disk drive. Priced at $175, Write Away is manufactured by Midwest Software Associates, PO Box 301, St. Louis, MO 63074. Reader Service number 473.

Preventive Maintenance for Apple and IBM Drives

Verbatim's Data Encore has developed a diagnostic software program that checks disk drives of the IBM PC and XT, PC-compatible systems and the Apple II, II Plus, IIe and III.

The Datalife Disk Drive Analyzer can effectively test the alignment of a drive without having to disassemble the computer.

In less than three minutes, the analyzer will run four comprehensive tests to check head alignment, disk clamping, write/read accuracy and disk speed. It then displays a readout with a good, fair or poor evaluation and a pass or fail rating indicating whether tested areas require adjustment and/or repair.

Datalife is available on 5¼-inch minidisks and is priced at $39.95. A new version of the Apple Disk Drive Analyzer with enhanced graphics features is also being offered at $39.95.

Datalife is manufactured by Data Encore, 585 North Mary Ave., Sunnyvale, CA 94086. Reader Service number 468.

The Tekterm of Apple

Tekterm is an intelligent software package with both communications and graphics capabilities.

It allows any computer to draw on Apple's screen and has five modes of operation to perform communication tasks.

Mode I features a high-resolution, 70-column display with easy-to-read upper- and lowercase characters with descenders.

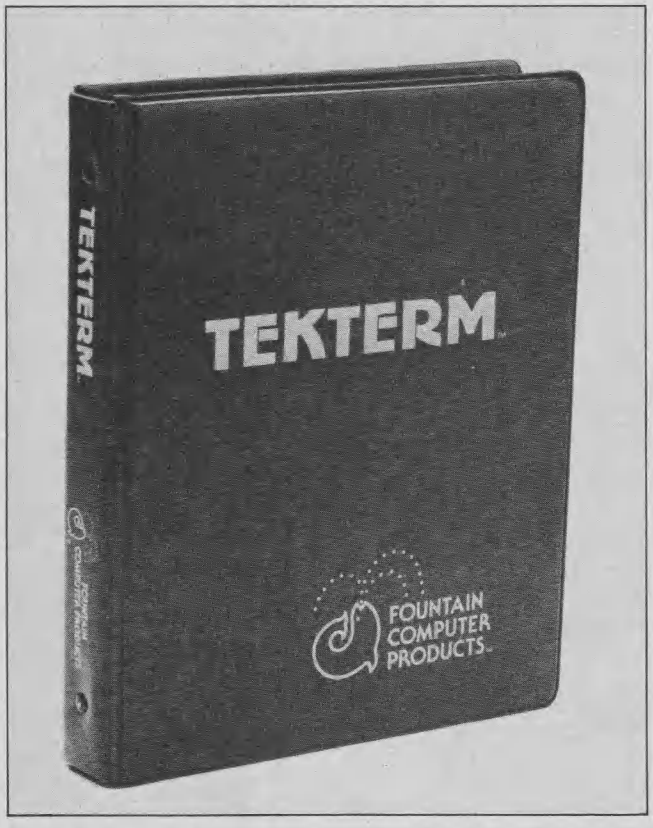
Mode II features a graphics terminal mode that does a complete simulation of the Tektronix 4010 (any software that runs on the 4010 will run with Tekterm). Sophisticated graphics can be performed in this mode.

Mode III is a communications mode that includes a complete selection of file transfer operations that allow information to be sent or received. Special modes allow complete screen images to be transmitted.

Mode IV is a Macro Mode and allows you to automate all communication operations. Predefined command and communications sequences can be stored in disk files to allow automatic dialing, log-on terminal configuration, and so on.

Tekterm incorporates other features, such as two text/graphics screens, variable speed playback, merge screens and keyboard remap.

Tekterm is available on floppy disk for the Apple II and II Plus. It supports Apple Comcard, D.C. Hayes Micromodem II, Apple Cat II and CCS7710 interfaces. It comes with a floppy disk and manual. Priced at $90, Tekterm is manufactured by Fountain Computer Products, 1901 Kipling, Lakewood, CO 80215. Reader Service number 474.



Tekterm is intelligent terminal software with both communication and graphics capabilities for the Apple II and II Plus.

VersaForm for IBM

Applied Software's release 2.7 of the VersaForm Business Form Processor under PC DOS and MS DOS 1.1 or 2.0 allows the nontechnical business and professional user to create business applications using a form-oriented record.

The new release operates on the IBM PC or XT, Columbia MPC, Compaq or Corona computers.

On-screen features include an easily understood electronic form that offers extensive data entry checking and automatic calculation capabilities.

Entering data into the form automatically creates a database of form records.

Data from VersaForm files may now be selected, sorted and written to a DOS file for use by word processors and other programs. Release 2.7 also includes hard disk support that allows data and program files to be installed on a hard disk with the IBM PC and XT and compatibles.

VersaForm functions have been enhanced for added speed and flexibility. A new feature called Search allows you to use values contained in all data fields, whether or not they have been defined as keys, to locate forms and bring them to the screen.

Registered owners of VersaForm may purchase an upgrade to the new release, including documentation and a date file conversion utility to aid changeover to PC DOS or MS DOS files for $75. Owners who are not registered must submit the original registration card or proof of purchase and VersaForm serial number with payment.

The new release costs $389. It is manufactured by Applied Software Technology, Inc., 170 Knowles Drive, Los Gatos, CA 95030. Reader Service number 475.

Managing Communications With IBM's PC, XT And Junior

The Personal Communications Manager (PCM) from Microcom, Inc., is available for the IBM PC and XT and PC Junior with 128Kb of memory, one disk drive and PC DOS 2.1. PCM also supports Microcom, IBM and Hayes modems.

The software, which incorporates the Microcom Networking Protocol (MNP), allows IBM products to exchange files of data or text with each other and with other products that support MNP including Micro/Courier and the PCS/2000 networking modem.

PCM also provides terminal

CHARTER OFFER
SAVE $2.00 OFF THE BASIC RATE!

RUN

THESE COULD BE THE KEYS TO YOUR FUTURE



Unlock *all* the potential of your Commodore 64 and VIC-20* with **RUN**.

Explore . . . Experiment . . . Enjoy . . . Beginner and expert alike will be taken beyond the manual to the limits of their abilities. Enter your own game programs. Construct a simple hardware add-on. Broaden your scope with unique applications . . . And . . . get a 13th issue FREE!

Enjoy key features like these:

- Games for fun & strategy.
- Programming tips help you learn short cuts.
- Candid reviews help you make money-saving decisions.
- Programs to add to your library.
- Instructions & tutorials to increase your skills.
- Hardware & software modifications help your machine work smart.
- Unique applications broaden your scope.

Here's a system-specific magazine written with you in mind. Written by and for the reader to give time-saving, money-saving hints. You'll get instructions and tutorials to increase your skills, and candid reviews to help you make the right decisions. Most of all though, you'll have fun.

Commodore 64 and VIC-20 owners are one of the largest groups of computerists today. Enjoy the benefits of this with your own magazine. Be in control like never before. Order **RUN** today and get a 13th issue free with your prepaid order (check or credit card) of only $17.97. Send in the coupon or call toll free *1-800-258-5473.* In N.H. call 1-924-9471.

*Send me a subscription to **RUN** for only $17.97 per year. I understand that with payment enclosed or credit card order I will receive a FREE issue making a total of 13 issues for $17.97. Save $2.00 off the basic rate!*

☐ *CHECK/MO* ☐ *MC* ☐ *AE* ☐ *VISA* ☐ *BILL ME*

card #_____ exp. date _____

signature _____

name _____

address _____

city _____ state _____ zip _____

Canada & Mexico $20.97; Foreign Surface $37.97, 1 year only, US funds drawn on US bank. Foreign airmail, please inquire. Please allow 6 to 8 weeks for delivery.

RUN • Box 954 • Farmingdale, NY 11737

342F7

**Commodore 64 and VIC-20 are registered trademarks of Commodore Business Machines, Inc.*

Circle 165 on Reader Service card.

TDK®
The heart of your system.

Dealer inquiries invited

5¼" Soft Sector Box/10

M1D-S	1 side/dbl dens	$27.50
M2D-S	2 sides/dbl dens	$39.50
M2D-X-S	2 side/quad 96 tpi	$44.50

8" Soft Sector

F1-S	1 side/sgl or dbl dens	$38.30
F2D-S	2 side/dbl dens	$44.50

Checks-VISA-MC-C.O.D./Add $2 Shipping
Call or write for our complete list.

LYBEN COMPUTER SYSTEMS
27204 Harper Ave., St. Clair Shores, MI 48081
Phone: (313) 777-7780

SAVE 50% ON TDK DISKETTES

Circle 202 on Reader Service card.

NEW!

VIC 20 E²PROM BOARD

Get the latest technology

- 2Kx8 nonvolatile storage
- easy to use
- in-circuit programming
- no prom programmer or UV eraser needed

...$95.00

ORCIM CORP
BOX 4295
SYLMAR, CA 91342
(213) 885-2452

Circle 132 on Reader Service card.

'68' MICRO JOURNAL™

6800-6809-68000

★ The only ALL **68XX** Computer Magazine

USA
1 YR.—$24.50 2 Yr.—$42.50 3 Yr.—$64.50
*Foreign Surface Add $12 Yr. to USA Price
Foreign Air Mail Add $35 Yr. to USA Price
*Canada & Mexico Add $5.50 Yr. to USA Price

OK, PLEASE ENTER MY SUBSCRIPTION
Bill my: M/C ☐ — VISA ☐

Card # _____
Expiration Date _____
For ☐ 1-Yr. ☐ 2 Yrs. ☐ 3 Yrs.
Enclosed: $ _____
Name _____
Street _____
City _____
State _____ Zip _____

68 Micro Journal
5900 Cassandra Smith Rd.
Hixson, TN 37343

Circle 296 on Reader Service card.

PROPORTIONAL SPACING on WordStar

Now you can have the professional appearance of typeset text using WordStar's built in print capability.PS is easier to read and allows up to a third more text on a page without appearing cluttered. Using it is as easy as turning on bold or underline and is done right in your document, then printed by WordStar automatically!

Easy to read instructions for printing in PS, setting **two or more justified columns** on a page, underlining spaces between words, and more. The techniques will work on all versions of WordStar, and will drive Diablo, Xerox, Qume, NEC, C.Itoh and other daisywheel printers. No technical knowledge is needed.

PS on WordStar - $20 postpaid

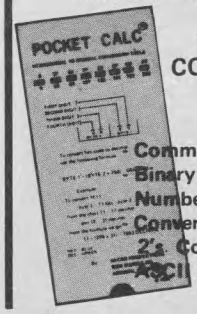
Please send me _____ Copies. Enclosed is my check (or Visa/MC# and exp. date) for $_____, made out to:

WRITING CONSULTANTS
Suite 160
11 Creek Bend Drive
Fairport, New York 14450
Call Toll Free 1-800-227-3800 Ext. 7018
Dealer inquires invited.

Circle 143 on Reader Service card.

POCKET CALC™

HEXADECIMAL TO DECIMAL CONVERSION TABLE



CONVERT HEX CODE TO DECIMAL IN SECONDS

Common Data Transfer Rates
Binary Representation of Hex Numbers 0 thru F
Converts a Binary Number to 2's Complement
ASCII and EBCDIC Codes

Dealer inquiries invited

Send $3.00 (2 for $5.00) with name and address to:

MICRO INNOVATIONS®
9898 Summit Road, Newark, Ohio 43055

Circle 211 on Reader Service card.

wabash®

Flexible Diskettes

6 Year Warranty - 100% Certified

DELIVERED PRICES

5¼" SINGLE SIDE SINGLE DENSITY 48 TPI W/HUB RING *Packed 10 per Soft Pack*	$1.60 each	BULK SSSD 100/Case White Envelope W/HUB RING	$1.40 each
5¼" SINGLE SIDE DOUBLE DENSITY 48 TPI W/HUB RING *Packed 10 per Soft Pack*	$1.89 each	BULK SSDD 100/Case White Envelope W/HUB RING	$1.70 each
5¼" DOUBLE SIDE DOUBLE DENSITY 48 TPI W/HUB RING *Packed 10 per Soft Pack*	$2.75 each	BULK DSDD 100/Case White Envelope W/HUB RING	$2.44 each

Free shipping in continental USA. Call for quantity discounts. We accept money orders, certified checks, VISA and MasterCard. Personal checks accepted, but take two weeks to clear bank. N.D. add 4%.

Software Services™
1326 - 25th St. S., Suite H4
Fargo, ND 58103
1-800-634-2248

ATTENTION

FOREIGN COMPUTER STORES
MAGAZINE DEALERS

You have a large technical audience that speaks English and is in need of the kind of microcomputer information the Wayne Green Publications group provides.

Provide your audience with the magazine they need and make money at the same time. For details on selling **Microcomputing, 80 Micro, inCider, Hot CoCo, RUN, jr, and Wayne Green Books contact:**

Sandra Joseph
World Wide Media
386 Park Ave. South
New York, N.Y. 10016
Phone—(212) 686-1520
Telex—620430

Circle 204 on Reader Service card.

SAVE UP TO 50% ON Floppy Disks & Computer Supplies

We Discount the Top Brands
3M-Scotch® • Verbatim® • Dysan
Memorex • BASF • Maxell®

We also stock
Ribbons • Paper • Labels
Cleaning Kits • Printwheels
Storage Products

Call, write, or utilize Reader Service for our FREE new DISCOUNT catalog

LYBEN COMPUTER SYSTEMS
27204 Harper
St. Clair Shores, MI 48081
(313) 777-7780

Offering Reliability and Same Day Service.

Circle 216 on Reader Service card.

CAN YOU C?

ADD THESE TO YOUR LIBRARY ...

C-PACK A disk full of useful utilities, for CP/M with C source code. Includes a **sector patcher, query delete** program, **disk backup** program, etc, etc. $19.

MEDIT A **sorted mailing list editor** with C **source** which can be used with Mark of the Unicorn's Scribble for **form letter generation.** $39.

VIEW A fancy CRT **disk editor** for CP/M, with C **source.** Inspect any block, modify any sector. More **stats** than STAT! $39.

ICX Deluxe CP/M <-> ISIS package. **Transfers** files to/from & **initialize** ISIS disks. **Complete C source** $89.
Also, **ISE:** ISIS **emulator** for debugging under CP/M. **Complete source** (Asm). $89.
Both ICX and ISE $175.

Supplied on Single Density 8" Disk
CP/M: Digital Research, Inc. ISIS-II: Intel Corp.

Western Wares
Box C
Norwood CO 81423
(303) 327-4898

emulation and permits access to any IBM editor.

It also features three major communications functions. First, PCM emulates an intelligent ASCII terminal, allowing operators to send and receive information in that mode. Second, it provides an electronic mail capability to and from all systems that support MNP. PCM also provides access to any IBM word processing editor resident in the computer. You can exit from the PCM program to compose and edit files and then return to PCM without having to reload the operating system and other software.

The menu-driven PCM software enables you to create an electronic address book of names and telephone numbers. A file may be transferred via telephone lines to an individual address or to a list of addresses. In conjunction with the PC Junior's clock, you can specify by date and time when material should be scheduled for unattended transmission.

PCM costs $100. It is designed by Microcom, Inc., 1400A Providence Highway, Norwood, MA 02062. Reader Service number 470.

Eagles Flock to Peachtree's Productivity System

Peachtree Software, Inc., has developed a new version of PeachText 5000 for the Eagle PC and Eagle 1600.

Peachtree 5000 is a complete personal productivity system that combines word processing, financial planning and simple database management features. The heart of the new package, the PeachText Word Processor, features sophisticated print and editing capabilities for creating and manipulating a variety of documents. It also incorporates an interface with the NEC 3550 printer and supports draft printers as well as numerous letter-quality printers.

Its high-performance Spelling Proofreader can check a 10,000-word document for spelling and typographical errors in less than two minutes. This package uses a standard 20,000-word dictionary.

PeachText 5000 includes the PeachCalc data analysis system. It offers a large electronic worksheet that includes up to 254 rows and 63 columns of text, numbers and formulas for financial and mathematical analysis.

List Manager is also included in the software package. As a simple database management system, List Manager permits you to define and create records with up to 14 data items. File size is restricted only by disk size, with a limit of up to 32,000 records.

PeachText 5000 is priced at $395 and is manufactured by Peachtree Software, Inc., 3445 Peachtree Road, N.E., 8th Floor, Atlanta, GA 30326. Reader Service number 471.

IBM Performance Analysis

Multipoint Network Design from Connections, Inc., is the first part of the NDS-Series for use on IBM PCs and other widely used microcomputers.

The software analyze all performance characteristics—such as response time, system utilization, topological configurations and cost variables—of any size network for the most cost-effective design.

Features include an English-language prompt system with a clear hierarchy of commands and a highly organized file structure. The network database is stored on disks for easy access time.

A menu-driven screen allows you to build libraries of all variable protocols and tariffs for modeling run comparisons. Descriptive graphics allow you to compare the results of any network design with other alternatives. Gross statistics on network traffic or application volumes may be input without manipulation.

Multipoint Network Design includes an automatic look-up of V & H and Digital-access city designations. It has the ability to define the number of operators, telephone trunks and terminals needed to meet the system's variable performance specifications.

Multipoint Network Design software costs $3500 from Connections, Inc., 322 East Center St., West Bridgewater, MA 02379. Reader Service number 472.

YOU MISSED IT!



But you still need that issue of *Microcomputing*.
Well, it's not too late to get it.
Send for your free Back Issue Catalog.
A complete listing, including editorial highlights.

You still need it.
And we've still got it.

YES, I want my free Back Issue Catalog for *Microcomputing*.

Name _____

Address _____

City _____ State _____ Zip _____

Microcomputing, Mail Order, 80 Pine St., Peterborough, NH 03458

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of Microcomputing

Extend my subscription one additional year for only $24.97

☐ Payment enclosed ☐ Bill Me

Canada & Mexico $27.97 1 year only U.S. Funds drawn on US bank. Foreign Surface $44.97 1 year only, U.S. Funds drawn on US banks only.

Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly.

AFFIX LABEL

If you have no label handy, print OLD address here:

Name _____

Address _____

City _____ State _____ Zip _____

Print NEW address here:

Name _____

Address _____

City _____ State _____ Zip _____

MICROCOMPUTING
P.O. Box 997 • FARMINGDALE, N.Y. 11737

Edited by Sheila Wright

CompuSource's New Desktops and Portables
Xerox 1810: Portable and Battery Operated
Soft-Touch Gives IBM Instant Response
TS 1605: A 16-bit PC-Compatible

Abacus Line of PCs

The Abacus desktop and Abacus portable are new PCs from CompuSource.

Both systems are compatible with Apple, CP/M and IBM software and peripherals.

The Abacus portable costs $1645 with a single disk drive and $1995 with twin disk drives. The Abacus desktop costs $1295 with a single disk drive and $1695 with twin drives.

The desktop is Apple compatible and may be made CP/M compatible for an additional $200. IBM compatibility may be added to either Abacus computer for $400.

Both models feature: an extensive software package with CompuCalc (spreadsheet), CompuWord (word processor), CompuBase (database), Backgammon, Blackjack and four space/action games. They also feature true upper- and lowercase keyboards with autorepeat, 64Kb dynamic RAM, 12Kb static memory, five Apple compatible I/O slots (expandable to seven), a game paddle port, video and rf outputs, and high- and low-resolution graphics. A full six-month warranty is also included in the package.

Both Abacus machines are available from CompuSource, Inc., 3112 Hennepin Ave., S. Minneapolis, MN 55408. Reader Service number 482.



The Abacus portable is a new PC from CompuSource, Inc.

Xerox 1810 Portable Computer

The Xerox 1810 is a portable computer with 64Kb of memory and an LCD screen. It can operate for up to ten hours on its rechargeable nicad batteries.

Special features include an appointment calendar, alarm clock, four-function calculator, speaker phone with automatic dialing capabilities, tape recorder, teletypewriter, text editor, electronic mail and Microsoft Basic programming language.

Its eight-bit processor is compatible with all CP/M software. The 1810 has the capability of using ROM packs, which come preprogrammed with added applications such as spreadsheets and business graphics.

In addition to the microcassette tape recorder for data or voice storage, special hardware features include: Centronics parallel and RS-232C serial ports for connecting input/output devices; a port for a monitor, an RF modulator for hookup to a television, a data link and an external microphone/speaker.

The 1810 operates on nicad rechargeable batteries or ac voltage. It has an 80-character, three-line liquid crystal display with graphics capabilities, a built-in modem to transmit data over the telephone and a standard keyboard with function and cursor-control keys.

It is priced at $2195 and is available from Xerox Corporation, Xerox Square 006, Rochester, NY 14644. Reader Service number 483.

IBM Has The Soft-Touch

Computer Technology Associates has introduced an IBM version of Soft-Touch, which provides IBM PC monitors with the capability of instantaneous responses to on-screen touch commands.

Special applications such as spreadsheet programs, instructional devices and command menus operate by touch.

Soft-Touch has several features: it fits the IBM PC or Amdek Color II monitor; it is supplied with all the hardware and software required to install and operate; and it can be accessed directly through IBM PC Basic without adding extra assembly language subroutines.

Soft-Touch is priced at $486.50. From Computer Technology Associates, 1704 Moon, N.E., Albuquerque, NM 87112. Reader Service number 480.

TeleVideo's TS 1605

The TS 1605, from TeleVideo Systems, is a 16-bit PC that is fully hardware- and software-compatible with the IBM PC.

It has the ability to be networked under CP/M-86. Its features include: standard 128Kb of internal memory, with optional expansion to 256Kb; high-resolution (640 × 200 pixels) graphics displayed on the TeleVideo standard 14-inch green phosphor display; two half-height 5¼-inch floppy disk drives, each providing 368.6Kb of formatted storage; one RS-232C asynchronous serial port and one IBM-style DB-25S parallel printer port; a detachable IBM-style keyboard with palm

rest and other features to reduce strain.

It is priced at $2995 and is available from TeleVideo Systems, Inc., 1170 Morse Ave., Sunnyvale, CA 94086. Reader Service number 481.

Eagle Spirit XL

The Eagle Spirit XL is a portable with a 10Mb hard disk and PC and XT compatibility.

The Eagle Spirit XL incorporates extensive graphics capabilities and includes Microsoft's MS DOS, Digital Research's CP/M-86 and Microsoft's GW Basic.

Flexmenu and Flexkey are optional features that let you create personalized menus and tailor keyboard functions. The keyboard is an enhanced standard IBM PC board.

As a standard feature, the Eagle Spirit XL includes color graphics capabilities that enable you to add an optional color monitor. It also features a combined monochrome and color graphics display card with composite and RGB output capable of simultaneous operation (640 × 200). There are two serial ports and one parallel port on the main CPU board, with four IBM PC-compatible hardware slots.

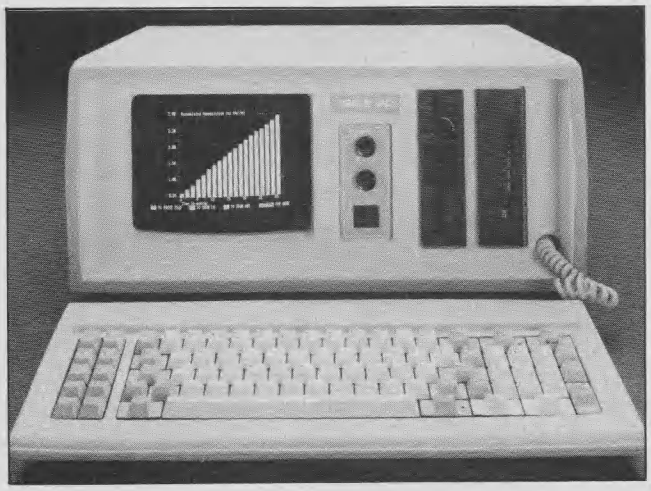
The basic system has a nine-inch, nonglare, integral monochrome monitor; a 16-bit Intel 8088 microprocessor and 8087 coprocessor option, with 128Kb of RAM, expandable to 640Kb on the main system board; an integrated 10Mb Winchester hard disk drive; and a 5¼-inch floppy disk drive with a 360Kb storage capacity.

The Eagle Spirit is serviced nationally by Bell and Howell's service force. It costs $4795 and is manufactured by Eagle Computer, Inc., 983 University Ave., Los Gatos, CA 95030. Reader Service number 487.

New Micro Takes TRS-80 Into CP/M Software World

The LNW80 Model 2 is a new microcomputer from LNW Computers.

The system provides TRS-80 users with stepped-up performance and accessibility into the CP/M software world. It is compatible with TRS-80 models I and III as well.



The Eagle Spirit XL is a tenMb hard disk portable from Eagle Computer, Inc.

The LNW80/2 offers:

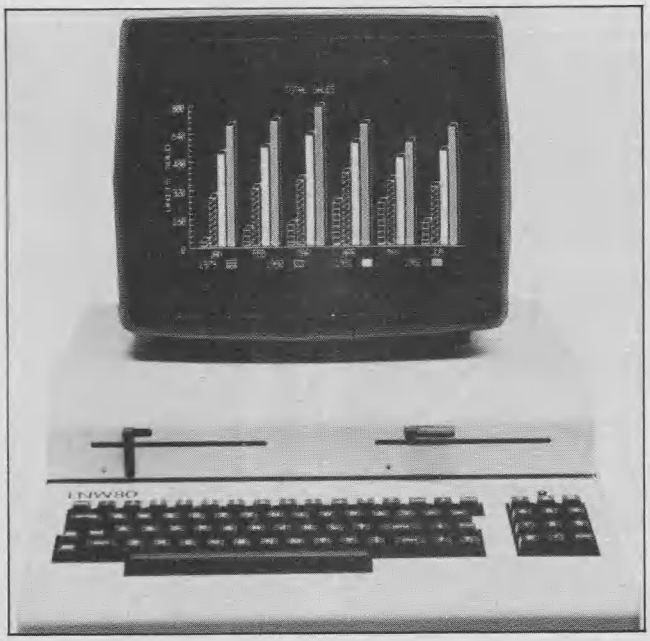
- CP/M compatibility for access to a business-related software library.
- 96Kb of memory and a 4 MHz operating speed with no RAM wait states.
- High- and low-resolution graphics in both color and black and white. In addition, with eight levels of gray intensity, the LNW80/2 lets you visualize on a monochrome monitor graphics originally designed for color display.
- A standard, free software package that includes: general ledger, accounts receivable, accounts payable, payroll, Electric Spreadsheet, Electric Pencil, Microterm (modem program), Chart-Ex (business graphics program), CP/M 2.2, DOSPLUS, LNWBasic and Microsoft Basic.
- Dual 5¼-inch floppy disk drives and a 12-inch high resolution monitor.

Additional features include support of 5¼-inch and eight-inch floppy disk drives, as well as 5¼-inch hard disk drives.

The LNW80 model 2 also attaches to dozens of video monitors (NTSC, RGB and monochrome types), over 16 different types of disk drives, both serial and parallel printers, plotters, modems and a variety of expansion accessories designed for the TRS-80.

The quality and reliability of the system can be enhanced by the use of a rugged steel case for the CPU and disk drives, goldplating on edge card connectors, IC sockets and by the use of a built-in cooling fan. It also comes with a one year warranty.

The LNW80 Model 2 is priced at $2695 and is available from LNW Computers, 2620 Walnut St., Tustin, CA 92680. Reader Service number 492.



The LNW80 Model 2 is a new microcomputer from LNW Computers.

Defending PC Data

Data Defender is a burglar alarm system that protects your data and computer from theft.

It is comprised of a pressure sensitive mat and a control module containing two 100-decibel horns. Plugging the Data Defender into any standard wall outlet activates the control module.

The system has been designed so that any unweighting will cause an immediate response from the Data Defender. The horns will alert you that your computer is in jeopardy. The manual reset key enables only those authorized with access to the existing system to deactivate the burglar alarm.

The system also is tamperproof: any tampering with the wires that connect the mat to the control module automatically activates the alarm. In addition, the battery backup provides continuous protection during power outages. It is designed to completely protect any computer system.

As an added option, more than one Data Defender mat can be connected to the control module in order to protect up to ten different computers, printers and disk drives.

The system is adaptable to any 12 VDC home or office security system.

Data Defender costs $189.95. Additional mats cost $32 and auxiliary-type plug-in sounding devices cost $24.95.

Data Defender is manufactured by PICOtronics, Inc., 820 E. 47th B-10, Tucson, AZ 85713. Reader Service number 489.

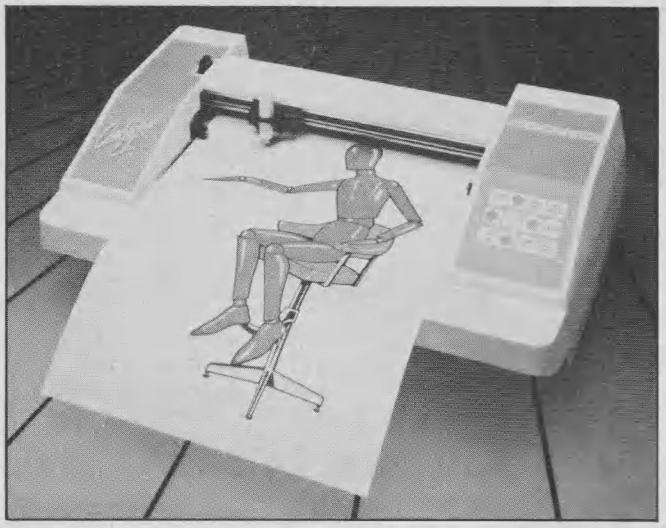
Vector 4-S System

The Vector 4-S system is an 8/16-bit business computer.

It is capable of reading IBM PC, XT and other soft-sectored floppy disks. Its floppy drive automatically detects the type of disk being used and whether that disk was created under MS DOS or under CP/M-86. The Vector 4-S will read eight- or nine-sector, single- or double-sided CP/M-86 or MS DOS disks with 48 or 96 tracks per inch. The floppy disk capacity has been expanded to 737Kb of formatted storage.

The 16-bit CP/M-86 operating system is included with every system. A Vector proprietary disk-partitioning feature allows both CP/M-86 and MS DOS 2.0 to reside simultaneously on the same hard disk. An 8-bit CP/M simulator is also included with every Vector 4-S.

With dual eight-bit Z80B and 16-bit 8088 processors and 128Kb of memory, expandable to 256Kb, the Vector 4-S business system incorporates an intelligent detached keyboard and green phosphor high-resolution graphics display, two modified S-100 expansion slots, a tone generator, an RS-232C communications port, and one serial and two parallel printer ports. An optional communications board and software provide both IBM 2770, 2780, 3741, 3780 and 3270 protocol emulation and access to remote microcomputers and mainframes.



Model CR-1810 ComScriber I personal plotter from Comrex International, Inc., produces charts, graphs and illustrations in several colors.

The system also includes the GSX-86 graphics extension, providing monochrome graphics with up to 16 levels of gray. With the optional AYDIN Controls external color monitor, color screen displays with up to 16 colors can be created.

An eight-bit Microsoft Basic interpreter and other software development tools are also included.

The single-user Vector 4-S microcomputer is available with one floppy drive, two floppy drives or with one floppy drive and a five, ten or 36Mb hard disk drive. The Vector 4-S/30, with a 737Kb floppy drive and a 5Mb hard disk drive, is priced at $4995, including a 12-inch high-resolution graphics display. Other 128Kb RAM systems range from $3295 to $9995. They are available from Vector Graphic, Inc., 500 North Ventu Park Road, Thousand Oaks, CA 91320. Reader Service number 485.

ComScriber I Plotter

The Model CR-1810 ComScriber I is a $695 plotter for IBM, Apple, Epson QX-10 and other PCs.

It has the ability to make alphanumeric and geometric graphs and illustrations in several colors on either standard paper or transparencies.

The ComScriber I can use either manufacturer-supplied or commercially available standard pens, paper and transparencies. Different color pens are available to draw multicolor plots. A pause feature permits easy changing of the pens. The basic plotting area of 8½ x 11 can be extended up to 120 inches in length. Characters from ⅛-inch high to 20 inches high can be drawn.

Line segments are accurate to one four-thousandth of an inch. ComScriber I draws at a speed up to six inches per second. The movements of the plotter are controlled by you on the 12-key keyboard. A self-test feature is also included. The plotter measures a compact 2.9 inches high, 14.3 inches wide and 8.8 inches long and weighs 7¼ pounds.

The CR-1810 ComScriber I plotter is manufactured by Comrex International, Inc., 3701 Skypark Drive, Torrance, CA 90505. Reader Service number 488.

51Mb Winchester Disk System

Sunol Systems has a new 51Mb Winchester Disk System that is compatible with the Corvus brand system.



The Vector 4-S from Vector Graphic, Inc., has both 8-bit and 16-bit processors.



Sunsol Systems introduces a 51Mb Winchester disk system.

Deadline Extended! Win $500 Worth of Prizes!!

Now is your chance to cash in on your robotics programming skill and creativity. Enter the first Microcomputing/Heath Company HERO 1 programming contest and win up to $500 worth of prizes. Microcomputing magazine, in conjunction with the Heath Company, manufacturers of the HERO 1, invites all HERO 1 programmers to submit their best applications to this contest. Entries will be judged in the following categories:

1. Standard HERO 1 with arm.

2. Modified HERO 1, including additional RAM or ROM, as well as any mechanical or electrical modifications.



Prizes will be awarded to the top three entrants in *each* category. Two $500 gift certificates (one from each category) will be awarded. Each first place winner will select the prizes of his choice, worth up to $500, from the latest Heath Company catalog. A $100 gift certificate, good toward any purchase from the Heath catalog, will be awarded to both second place winners. Third place winners from each category will receive a copy of Microcomputing columnist Mark Robillard's new book, "HERO 1 Advanced Programming and Interfacing," plus a one-year paid subscription to Microcomputing magazine.

CONTEST RULES

1. All programs must be submitted both on cassette tape and in hard copy form. A brief, written description of the application must accompany each entry.
2. Entries in the modified category must include a complete description of the alterations performed on the robot.
3. The contest is open to all HERO 1 owners, except employees of Wayne Green Inc. (publisher of Microcomputing), and the Heath Company and and their immediate families.
4. All entries, including programs, become the property of Microcomputing.
5. All entries must be received by Microcomputing by March 1, 1984.

Send submissions to:

Robotics Contest
Microcomputing
80 Pine Street
Peterborough, N.H. 03458

7. Contestants may submit more than one entry in one or both categories. Entries will be judged on originality and technical feasibility. The more practical and easily adaptable the application, the better. Winners will be announced in the June 1984 issue of Microcomputing. So rev up your robot, and let's put the Heath's HERO through its paces!

MICROCOMPUTING®

80 PINE STREET PETERBOROUGH, NH 03458

Host adapters are available for IBM, Texas Instruments, Apple, Radio Shack and other microcomputers.

On-line, back-up storage is available via a removable ¼-inch tape cartridge with a list price of $1295. The back-up unit has a capacity of 32Mb.

It's also possible to stack as many as four 51Mb modules in the system and achieve 204Mb of storage. As many as 64 users—and up to seven different operating systems—may share a single Sunol Systems mass storage unit.

The 51Mb Winchester disk system costs $4595. It is manufactured by Sunol Systems, PO Box 1777, 1072 Serpentine Lane, Pleasanton, CA 94566. Reader Service number 494.

Commodore Conserves Energy With a Home Controller

Computer Interface Module 112 (CTM 112) is a home controller that regulates lights and appliances.

It is presently designed for use with Commodore computers, including the Commodore-64 and the VIC-20.

The unit saves energy through its scheduling capabilities and through duty cycling, a timing control method that makes more efficient use of energy.

Tax credits may be available when combined with solar applications.

CIM 112 is priced at $450 and is manufactured by Savergy, Inc., 1404 Webster Ave., Fort Collins, CO 80524. Reader Service number 495.

Digital ESP-1 Port Expander

The Digital ESP-Port Expander is a low-cost RS-232C A-B-C-D switch.

It creates four RS-232C serial ports from one. The device allows instant switching to different printers, plotters and other peripheral devices under complete software control. Manual overrides permit easy program verification.

The device requires only a two-character instruction and a prefix, followed by a port designator.

The Digital ESP-1 Port Expander switches four lines per port and can be cascaded to operate unlimited ports without waste. The unit measures 8× 6 × 1.8 inches and consumes five watts.

The Digital ESP-1 Port Expanded costs $395. The price includes an RS-232C 25-pin male with four feet of cable (DTE), and AMPHENOL 17-305-01 (P/N CES-CS). It is manufactured by Digital Laboratories, Inc., 600 Pleasant St., Watertown, MA 02172. Reader Service number 493.

Corvus Winchester Disk Systems

The Corvus Winchester disk systems Model 6, Model 11 and Model 20 free your computer from disk drive restraints.

The systems may be connected to a Corvus Omninet or Multiplexer local area network. This allows more than 60 computers to share the disk system, printers and other peripherals. It also provides intercomputer communication.

The systems have features such as a thin film-plated medium which allows greater bit densities, a sealed environment and a built-in cooling fan.

The Corvus disk controller uses its own microprocessor to ensure rapid data transfer with such features as read-after-write verify, automatic error retries, transparent formatting with CRC (Cyclic Redundancy Check) error detection and high-speed data transfer using direct memory access.

All Corvus disk systems come with a six-month parts and labor warranty; warranty extensions of up to 24 additional months are available.

The Model 6 costs $2195; the Model 11 costs $2995 and the Model 20 costs $3995. They are manufactured by Corvus Systems, S.A., 58 Rue de Moillebeau, CH—1209 Geneva, Switzerland. Reader Service number 484.

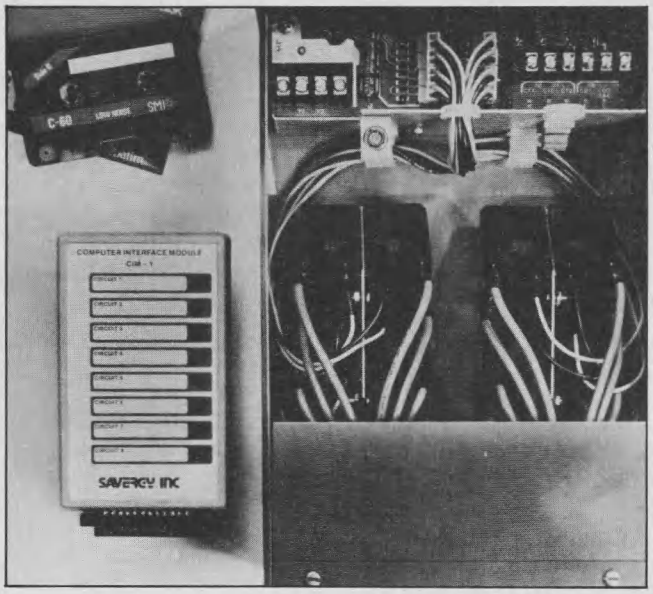
Adaptec's Controllers: IBM Compatibility

ACB-2002 and ACB-2000 are two IBM PC- and XT- compatible controller boards.

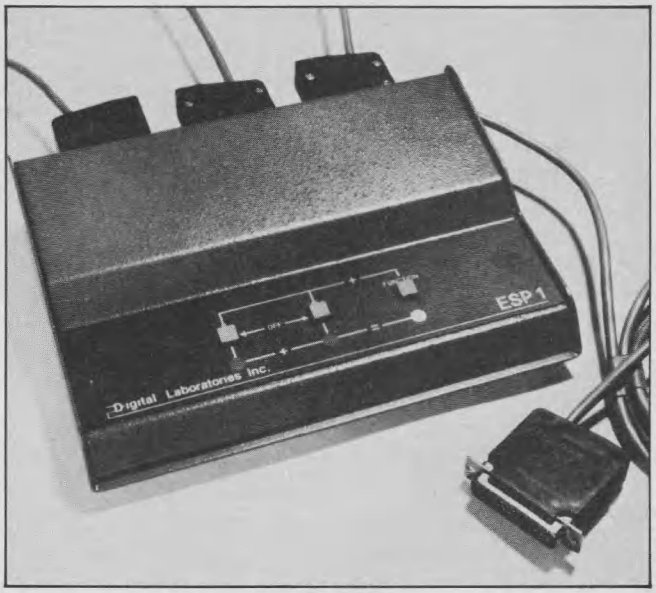
The ACB-2002 controller board is IBM compatible at the software, hardware and drive magnetic level. This provides full support of an IBM- compatible BIOS, implemented through the ACB-2002 EPROM socket, or support of a custom disk drive routine implemented through the controller's I/O port.

The ACB-2000 is also software compatible but allows up to five times the performance of existing IBM PC-and XT- compatible systems by trading drive magnetic compatibility for more efficient disk formatting and utilization. The ACB-2000 controller offers an ECC polynomial specifically designed for sectors of 256 bytes to 2048 bytes.

Both controller boards are priced at $225 in small OEM quantities. They are manufactured by Adaptec, Inc., 580 Cottonwood Drive, Milpitas, CA 95035. Reader Service number 486.



Computer Interface Module 112 is a home controller from Savergy, Inc.



The Digital ESP-1 Port Expander is a low-cost RS-232 A-B-C-D switch from Digital Laboratories, Inc.

NEVADA SOFTWARE

FOR CP/M®. TOP QUALITY, BOTTOM PRICE.

Nevada makes it easy and economical to get the software you want and need. Need a better BASIC? We've got it. Is BASIC not solving your business or engineering problems? Nevada COBOL or FORTRAN will. The media praises Nevada, and it's priced right: just $39.95–about 1/10 what comparable quality costs. For about half the price of one competitive package, you can own the *entire* Nevada Software library! So don't wait; order one or two or all of our bargains–today.

NEVADA BASIC™

Diskette & 220-page manual
For business, education engineering, science

Finally, a better BASIC. This straightforward language lets beginners write useful programs without limiting them to simple programs. New Nevada BASIC's interpreter has Prof. Starkweather's great built-in full-screen text editor. You can define single- *and* multi-line functions. Plus there are full-matrix operations, Random Access and Sequential files, program execution with a simple command, BCD Math–no round-off errors. With Nevada BASIC, micros can run like minis costing thousands more.

NEVADA COBOL™

Diskette & 165-page manual
For business

Whether you do business computing or learn computing for business, COBOL is *the* language; more business application software is in COBOL than in all other languages combined. Based on ANSI-74 standards, Nevada COBOL offers many advanced features: Random Access and Sequential files, debugging capability, COPY statement, character string, 16 bit binary and decimal data types. Colleges use the fine documentation as classroom texts. It's field-proven by 10,000+ worldwide business, government and education users. Join them.

COBOL Application Package–Book I. Superior user documentation that saves even experienced programmers many hours.

NEVADA FORTRAN™

Diskette & 204-page manual
For science & engineering

"If you want to learn or teach someone FORTRAN, this is the package to buy." ACCESS, *March/April 1983.* For learning and teaching, for scientists and engineers, Nevada is the perfect FORTRAN. Based on ANSI-66 standards (FORTRAN IV), its advanced features include IF..THEN...ELSE constructs, COPY statement, CHAINing with COMMON, TRACE style debugging, and 150 verbal error messages. And you can intermix in-line FORTRAN and Assembly Language statements for special micro needs. Requires 48K RAM. If you're shopping for FORTRAN, look no further.



NEVADA PILOT™

Diskette & 131-page manual
For dialogue

Perfect for training, testing, virtually all programmed instruction, and word puzzles. It's the ideal companion language for BASIC, COBOL, and FORTRAN application packages, because it so quickly solves training and documentation problems. Nevada PILOT meets all PILOT-73 standards and has many new features including a built-in full-screen text editor. Prof. Starkweather's documentation is exceptional; the manual comes with 10 free programs. See *MICROCOMPUTING* review, January 1983, and you'll be convinced.

NEVADA EDIT™

Diskette & 59-page manual
For text editing

"A well-thought-out product with excellent documentation and an astoundingly low price." MICROCOMPUTING, *May 1983.* Now, high-quality text editing for micros. A character-oriented full-screen display editor, Nevada EDIT is great for program editing as it's specifically designed to create COBOL, BASIC, and FORTRAN programs. Simple to configure, you customize tab stops, default file type, keyboard layout, and CRT by menu selection. Nevada EDIT may pay off better than any software purchase you've made.

EACH ONLY $39.95

COBOL Applications Package–Book I: $9.95

Money back guarantee: you must be completely satisfied, or return the packages(s)–in good condition with the sealed diskette(s) unopened–within 30 days, and we'll gladly refund your money.

CP/M is a registered trademark of Digital Research, Inc. TRS-80 is a registered trademark of Tandy Corp. Apple II is a trademark of Apple Computer, Inc. Osborne is a registered trademark of Osborne Computer Corp. Xerox 820 is a trademark of Xerox Corp. Kaypro is a trademark of Non-linear Sys. Heath/Zenith is a trademark of Heath Corp. IBM is a trademark of International Business Machines, Corp. Nevada BASIC, Nevada COBOL, Nevada FORTRAN, Nevada PILOT, Nevada EDIT, and Ellis Computing are trademarks of Ellis Computing, Inc. © 1983 Ellis Computing, Inc.

SINCE 1977

Send to
ELLIS COMPUTING, INC.
3917 Noriega Street
San Francisco, CA 94122 Phone 415/753-0186

Please send me: **Software Packages**
☐ BASIC ☐ COBOL ☐ FORTRAN ☐ PILOT ☐ EDIT

Disk Format

☐ 8" SSSD (Standard CP/M IBM 3740)

5¼" Diskette for:

☐ Access
☐ Apple CP/M
☐ DEC VT 180
☐ Epson QX-10
☐ Heath Hard Sector (Z-89)
☐ Heath Soft Sector (Z-90)
☐ IBM-PC (Baby blue or big blue card)
☐ Kaypro Double Density
☐ Micropolis Mod II (Vector Graphic)
☐ NEC PC 8001
☐ Northstar Double Density
☐ Northstar Single Density
☐ Osborne (Single Density Disk)
☐ Sanyo
☐ Superbrain DD, DOS 3.X (512 byte sec)
☐ Televideo
☐ TRS-80 Model I (Relocated to 4200 hex)
☐ Xerox 820 (Single Density)

Send my order for ____ packages @ $39.95 each Total ____

COBOL Application package @ $9.95 each Total ____

California residents add 6½% Sales Tax. Sales Tax ____

Outside North America, add $6 per package for shipping. (Postage paid within North America.) Checks must be in U.S. dollars and drawn on a U.S. bank. Shipping ____

☐ Check enclosed ☐ Mastercard ☐ VISA **TOTAL** ____

Card # ____ Exp. Date ____

Signature ____

Ship to: Name ____

Street ____

City/State/Zip ____

The CP/M operating system, an 8080, 8085, or Z-80 microprocessor, and 32K RAM are required. Note: Double Density drives can read Single Density diskettes.

Circle 192 on Reader Service card.

(From p. 146.)

of your documents. As expected from the name, the primary purpose of Footnote is to insert footnotes into your text quickly and systematically, and it does this job very efficiently.

Digital Marketing states that Footnote and Pair are intended for use with WordStar 3.0 or later. Versions are available for 48Kb CP/M 2.2 systems or CP/M-86 and IBM PC DOS systems with 64Kb.

After working with WS version 3.0, I tried an older WS, version 2.10, and found that both Footnote and Pair run fine, the only difference being that a few lines of stray text are displayed when Pair is processing the file. All program features work as intended.

Footnote controls are compatible with WS conventions with one exception. You must alter nonfootnote-forced page boundary markers (.pa) and conditional page markers (.cp) by adding a second leading period.

Flexibility is one of Footnote's strongest points. You can opt for placement of notes at the bottom of each affected page or at the end of your file. You can create footnotes as you go along, type them at the end of the paragraph to which they pertain, put them at the end of your text or prepare a completely separate file of footnotes to merge with the main document.

Footnotes are numbered sequentially. In the unusual situation where you need a second or subsequent reference to the same footnote, the repeated number must be typed in manually. If you edit a numbered file containing footnotes and change notes to which markers refer, you should replace footnote markers with WS and run the numbering portion of the program again.

Regular WordStar facilities are used to edit footnotes. You can elect to either split long notes between pages or maintain the integrity of a note on a single page by designating the minimum amount of text that must appear on a footnoted page.

Elementary

Learning the basic elements of footnoting won't even take three minutes. An at sign (@) indicates the location of a footnote in your text; control-R (↑R preceded by ↑P, as required by WS) signifies the beginning of notes; @ separates or delimitates the start of each note; and .pa ends the notes section. The nuances are a little more involved, but the entire system is quick, easy to use and straightforward.

After inserting footnote indicators and typing your footnotes either in the text or as a separate file, you call the FN command file. The program menu offers four functions or an exit to CP/M or your operating system.

Choose N for the initial step. The name of the document file to be numbered and the beginning footnote number are requested. All markers are consecutively numbered by footnote. If your notes are in a separate file, both that file and the main text file must be numbered.

By entering footnote markers and not creating any footnotes, the N option can be used to number chapters, sections, lines and so on, beginning with any number you select. However, your last number can't exceed 32767—higher numbers cause erroneous results.

An error message appeared at times when I used Footnote to number segments of a file with large numbers, but examination of the file showed that there was no error and all sections were numbered properly.

You have three alternatives for footnote numbers in the body of the document:

- superscripted ² (½-character height above text characters);
- superscripted, underlined and followed by a slash, ²/ and
- underlined and followed by a slash on the same line as the text, 2/. For the note itself, you can either print the number preceding the note in the same manner as the marker or print the number directly on the same line where the footnote starts, followed by a period.

Formatting the file with the F menu option converts your numbered markers to standard WordStar commands, places footnotes at the bottom of the page and carries over any long notes if required.

If you choose to put footnotes in a separate file, it must be merged with the main document before formatting. After numbering and formatting, the processed file contains only regular WS directives and can be edited as you desire with WordStar.

The third menu choice, R for Remove, opens a new file, deletes the notes from your text and writes them sequentially into the new note file. M accomplishes the reverse operation, merging the contents of a note file into your text without destroying the original footnotes.

Playing with Parameters

Part of the Footnote system is a file entitled OPTIONS.FN, which enables you to modify most of the operating parameters. Using WS, you can edit the file contents to change control characters or values for nine items:

- the number of lines of text on pages with or without footnotes
- the marker for footnote numbers and related print control characters
- control characters for beginning of notes on a page
- control character for any linefeeds inserted to move footnotes to the page bottom
- printing style (superscript or other) for marker and number in footnote
- the splitting of long notes between pages. A short summary describing use of the different parameters follows the controls in the OPTIONS.FN file.

Footnote's command file requires 30Kb; OPTIONS.FN takes 4Kb and Pair another 4Kb. When you run Footnote or Pair, the processed file is tagged with the original filename and your previous file is given a BAK-type designation. Therefore, you should be sure to have sufficient disk space for saving the newly generated file. After the first operation on the file, you still have your original data in the BAK file, which can be renamed if you want to retain it.

Pair—Proof Positive

Pair is a proofing tool that checks your manuscript for matching sets of control characters. If a matching control for underlining, boldface, or a matching character for parentheses, brackets or quotes is not located within the number of spaces you set, a marker is inserted into the file at the end of the search length.

Like some spelling programs, you use the WS search routines to locate the markers, but then you need to scan back to the unmatched character and find the proper termination point to insert the missing control. Controls may be checked for superscript, subscript and doublestrike as well, though not covered in the documentation.

Characters to be matched, the length of the search area from first to second character for pairing, and markers to be inserted are changed by editing the OPTIONS.FN file. A valuable runtime option permits changing the character to be matched directly in the command line of Pair, which avoids the editing of OPTIONS. FN.

You need practice with Pair to decide on the length of a search for closing control characters to fit your pattern of usage. If search length is too short, Pair won't find the matching item and will mark an error. If set too long, the beginning control of the next set may be matched with an erroneous control.

You'll find Pair useful primarily with larger, more complex files that make considerable use of boldface, underlining and brackets. Avoiding aborted printouts of long files justifies the time required to run Pair and then track down unmatched controls.

The short manual is attractive and well-spaced, with an adequate table of contents and index. Two pages are devoted to a discussion of common errors with Footnote, their causes and corrections. The last two pages, describing Pair, are after the index.

Description of program operation should be expanded and a number of typographical errors cleaned up. These deficiencies don't significantly impair

use of the manual and may be corrected by the time this review is published, since a revised manual is being written.

For tutorial purposes, two sample files on the distribution disk are discussed in the documentation. Addition of a quick reference card summarizing options, editing techniques, errors and corrections would be helpful. Should you run into problems, Digital Marketing will answer your questions on its hotline at 800-826-2222 or 415-947-1000.

Pair is helpful mostly as a safety check before printing a large file. Footnote is clearly the standout of the two programs for me and will be used more frequently. The ease with which you can insert footnotes and make changes without the necessity of adjusting all of the following pages makes Footnote worth its weight in gold.

If you use footnotes in your work with any regularity, you just can't afford to be without this package.

Charles Perelman
Beverly Hills, CA

Access Manager

System Requirements: Any CP/M or MP/M system.
Manufacturer: Digital Research, 160 Central Ave., Pacific Grove, CA 93950.
Price: $300 for eight-bit version; $400 for 16-bit version.

File manager routines are used to easily and quickly create, retrieve, edit and delete data stored in files. Basic provides sequential and random files, but not indexed files. Access Manager, from Digital Research, provides these indexed file management routines that can be linked to compiled programs.

Access Manager is a collection of index and data file management subroutines and utility programs that can recreate or repair damaged files (Recreate) and use these files in a multi-user environment (File Server).

Access Manager can be used with Digital Research languages (CB-80, PL/I-80 and Pascal/MT+). It operates both in a single-user mode with CP/M or MP/M and in a multi-user mode with MP/M. Record and file locks keep operations straight in a multi-user system. Access Manager is especially suited for people who need indexed data files when using these languages.

The features and benefits of Access Manager are best explained by dividing its processes into eight categories: initialize, open, lock, add, delete, change/update, find and close.

Initialize

These routines set up the environment where all the other routines will operate. In a multi-user system, the routines set the user number and inform other routines of what to do when an error is encountered.

When an error occurs, this action may return an error code or may actually halt the program. Initialization routines also set up file buffers in the program, set a maximum number of index files that can be open at any one time and establish the size of the index records.

Open

These routines open index and data files for use in a program. If a given file doesn't exist, it is created. Open routines also check the integrity of the file and determine if the file has been "clobbered." In a multi-user system, open is used to indicate that the file is to be shared or to be used exclusively by one user. Open also returns the record length for the data or index file. Open, and all the other routines, return an error or success code to tell you whether the called routine is successfully performed.

Lock

In a multi-user environment, lock keeps files from being garbaged when two or more programs try to write into the file at the same time. Lock also contains routines to release or unlock a previously locked file or record.

Add

Add routines add data records to a data file and key values to a key or index file. Add locates the next available record in the data file. Data is put in a program buffer and the buffer is then written into the new record.

To add a new key value to an index or key file, you simply place the value in a buffer (string) and call the routine that places this new value in the proper place in the index.

Delete

Delete routines effectively erase a record from a data file or a key value from an index file. Once deleted, a data record is still available for reuse. The deleted key value, however, is gone. You can no longer access a particular data record via that key value. The data record may actually still be there, but the key value and its associated data record pointer have been deleted for good.

Change/Update

To change a record in the data file, you first read the record from the file into a buffer (string). Then changes can be made. The buffer is rewritten into the same record in the file.

Access Manager doesn't have change routines, but it does have read and write routines. An update routine can be used with the index file to change a key value already stored in the index file. Therefore, a key value can be moved to a different location in the index file structure. A crude way to do this is to delete the old key and add the new one, but this takes more time.

Find

The Find routines are the most useful ones in Access Manager. These routines find the exact match for a specified key. You can also look for a key that is greater than or equal to the one specified. Access Manager will also find the key before the one specified.

One useful find routine locates the first index entry and another locates the last index entry. Both routines are useful for printing reports and listing a file in alphabetical order.

Two other routines find the next and the previous keys in the index and enable you to go forward or backward through the index.

Close

The routines to close both data and index files are used at the end of the program. They force any remaining data or index values to be written from buffers in the program out to the disk. Failure to do this causes loss of data in data files, and, more importantly, it causes index files to be garbaged.

And In Conclusion . . .

Access Manager is an excellent file management package for microcomputer users. Before writing your own file manager, think about using Access Manager instead of reinventing the wheel.

Linda Gail Christie
Tulsa, OK

Micro-Tax

System Requirements: Any CP/M machine with 48Kb, or any MS DOS or PC DOS machine with 96Kb; two 126Kb disk drives are recommended.
Manufacturer: Microcomputer Taxsystems, 6203 Variel Ave., Suite A, Woodland Hills, CA 91367.
Price: $195–$2000.

It's that time of year again. Suddenly, you realize that your tax records are in terrible shape. In a panic, you start trying to sort out your tax status: what you've earned; how you spent it; and, most important, how to make everything legal and defensible to the Internal Revenue Service.

That Old Familiar Song

As you plow through stacks of receipts and expense statements stuffed in your drawers, you suddenly remember seeing an ad for a tax preparation program for your computer. The light goes on! "Aha," you think, "I'll buy a tax package and let it do my taxes for me."

Racing to your local computer store, you ask for Micro-Tax. It promises to take the drudgery out of doing your taxes. To

quote the ad, it promises to produce "great returns on your personal computer investment." Arriving home with your purchase (which may be tax deductible), you settle down to watch the program do its stuff.

If this sounds too good to be true, it is. The tax preparation package enjoys a resurgence of popularity at this time each year. Some of the advertisements for these products prey upon fears people have of the Internal Revenue Service. They promise error-free returns with no effort.

Unfortunately, many of these products are the creation of modern-day hucksters, who sell a product as effective as latter-day snake oil. Tax programs that promise to take all the work out of doing taxes are really selling you a bill of goods. No program can take all the drudgery out of preparing your taxes.

But, if you're in the business of preparing tax returns for others or if your are just plain fed up with filling in all the boxes on the Internal Revenue Service forms, then this review of Micro-Tax can offer you some insight into what a tax preparation package can do.

The Basics

The first requirement for getting your taxes done is to have a good record-keeping system. This may not sound very electronic—it isn't. The computer can do a lot of things for you, but one thing it can't do is create tax records out of thin air.

There are good accounting packages that will ease the burden of keeping your tax records, but a shoebox with all your receipts in it will work, too. When you have your records together, Micro-Tax can go to work for you.

Microcomputer Taxsystems, Inc., has been in the tax preparation business for five years. It offers updated packages annually for Micro-Tax at a nominal cost. It also offers tax packages for a number of state forms as well.

A newsletter and frequent communications from the company about any bugs or fixes in their software keep Micro-Tax purchasers well-informed about things that affect their purchase and their business. It appears that support for Micro-Tax will be excellent.

Program Info

Micro-Tax is written in compiled Basic. It is menu-driven and is just about goof proof. Micro-Tax is aimed at the person who does tax preparation as a business. Accountants, lawyers and general tax preparers are all likely beneficiaries of this program.

Micro-Tax offers its software in four levels. Level I, the individual package, is the least expensive and the least comprehensive. It retails for $195. It's designed to handle 14 of the common schedules and forms used by individual taxpayers.

Level II, the professional package, retails for $1000. This package will compute 30 schedules and forms and handles batch processing of client information. The Level III package also retails for $1000 and is designed for partnership and corporate tax preparation.

> Many tax-preparation programs are the creation of modern-day hucksters.

There is a Level IV package, called the Overseas Tax Package, as well. The state packages sell for $250 to $750, depending upon the complexity of the state tax laws.

The documentation for Micro-Tax comes in an 8½ × 11, three-ring binder and is very thorough. The only thing lacking is the cookbook approach to getting the system copied from the distribution disk to working disk.

The instructions for getting started suggest you should have already learned how to copy operating sytems, format disks and perform other routine maintenance activities on your system. Since Micro-Tax is written for so many systems, the people at Microcomputer Taxsystems, Inc., must have decided they simply couldn't keep up with the various hardware configurations available. At the price being charged for this program, I expected a better system setup description.

Easy Does It

Once you have a copy of Micro-Tax running, things get pretty easy. The menu leads you through the program without a hitch in roughly the same order that you prepare you tax forms manually. First you choose which schedules you want to use to do your taxes. That done, you can begin to enter data, led at all times by the menu.

This is where the ads, which suggest that tax preparation is all play and no work if you have a computer tax program, start to fall obviously short of the truth. If your records are in good shape, Micro-Tax is easy to use because you have the information it requests. If you don't have a good record-keeping system, then you are in for the same long night you would have been without the program.

Perhaps the greatest benefit of Micro-Tax, and other programs like it, is the way in which it leads you through your tax preparation. Micro-Tax takes you through all the tax forms you have designated one line at a time.

It's difficult to leave out an item or forget anything with Micro-Tax as your guide. When you've completed one form, the program prompts for information for the next. You can complete all the forms at one sitting or break the work into smaller chunks.

A Light to Guide Your Way

An analogy is to think of Micro-Tax as a road map showing you a way through the maze of federal tax forms. It offers assistance by asking questions about where you've been and where you're going. If you habitually get lost trying to do your taxes, Micro-Tax can help you find your way.

Micro-Tax has a batch processing mode that can be very helpful if you prepare many tax returns. You can interview people all morning and then tell Micro-Tax to spend the afternoon doing their taxes while you busy yourself with other work.

The program will print tax information on blank paper or on preprinted tax forms. If you wish to print on blank paper, Micro-Tax can print IRS-approved substitute forms.

It can also furnish transparent overlays of the federal tax forms, which can be placed over the plain paper copies of the tax forms and then photocopied to produce forms for submission to the Internal Revenue Service. The overlays aren't free, however, and will set you back from $150 to $250 per set, depending on the level of tax package you've purchased.

Micro-Tax can also handle accelerated cost recovery, income averaging, self-employment taxes, alternative minimum and maximum taxes and computation of underpayment penalties.

A Session With Your Analyst

A typical session with Micro-Tax goes something like this: After you have entered the client's name, a three-letter identifier and the social security number of the taxpayer, you're presented with three options. You can select tax schedules, go to data entry or exit to the main menu. The normal choice for a new client is schedule selection.

In schedule selection, you are given a list of the various Internal Revenue Service forms that Micro-Tax can prepare. You should go through the list and select those forms that apply.

From schedule selection, you exit to the menu. Here you normally select one of the data entry options. Micro-Tax will lead you through each tax form, prompting you for the required information.

When you have completed all data entry, you exit the data entry program and can either exit this module and return to the main menu or go directly to the tax computation module

In the tax computation module, the program will compute just the tax schedules you select or all the schedules for the taxpayer. If you tell Micro-Tax to compute all schedules, it will do so in the proper order; that is, if one schedule depends upon another, the schedule that can stand alone will be processed first. As

Circle 52 on Reader Service card.

Serial ◀▮▮▮▮▮▮▮▮▶ Parallel



PRINTERS!
PLOTTERS!
PUNCHES!
ROBOTS!

Convert What You Have To What You Want!

* RS232 Serial
* 8 Baud Rates
* Latched Outputs
* Centronics Parallel
* Handshake Signals
* Compact 3¼ × 4⅝ × 1½

No longer will your peripheral choices be limited by the type of port you have available! Our new High Performance 700 Series Converters provide the missing link. Based on the latest in CMOS technology, these units feature full baud rate selection to 153K, with handshake signals to maximize transfer efficiency. Detailed documentation allows simplified installation. Order the Model 770 (Ser/Par) or Model 775 (Par/Ser) Today!

only $89.95

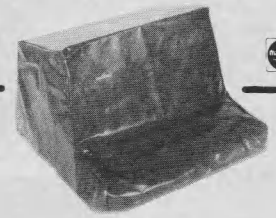
Buffer Products Coming Soon!

Connector Option $10.00
CA Residents 6% tax
UPS Shipping $3.00

CALL (805) 487-1665 or 487-1666
For FAST Delivery

Circle 90 on Reader Service card

CompuCover



COVER YOUR INVESTMENT

* Static Free
* Cloth Backed Vinyl
* Custom Fitted
* Clear Plastic

WE COVER ALL SYSTEMS
FROM ADDS TO ZENITH

1-800-874-6391
ORDER LINE

Dealer Inquiries Invited

CompuCover
P.O. Box 324 Dept. A
Mary Esther, FL 32569

Customer Service
(904) 243-5793
Telex 469783

CALL TOLL FREE

Circle 134 on Reader Service card.

JVS–FORTH $10
* SUPPORTS BYTE, INTEGER, AND REAL DATA
* COMPLETE ACCESS TO CP/M
* REQUIRES ASSEMBLER/LINKER BELOW

BASIC COMPILER $20
* SUPPORTS INTEGER, REAL, AND STRING DATA
* 25 STATEMENT TYPES
* GENERATES 8080 ASSEMBLER CODE
* RUN TIME LIBRARY SOURCE AVAILABLE ($50 EXTRA)
* MANUAL ONLY $5 (REF. WITH SOFTWARE PURCHASE)
* REQUIRES ASSEMBLER/LINKER BELOW

ASSEMBLER/LINKER $10
* SYMBOLIC 8080 RELOCATABLE ASSEMBLER
* LINK EDITOR (LIBRARY SEARCH CAPABILITIES)
* LIBRARIAN FOR LINK EDITOR LIBRARIES

FREE BROCHURE AVAILABLE

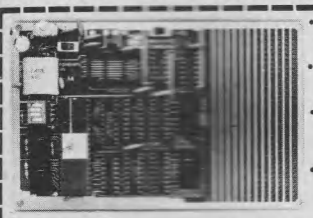
REQUIRES CP/M-80 V2.2 AND 32K
8" 3740 SSSD OR APPLE 5¼" 16-SECTOR
DISK FORMATS ONLY

WHEN ORDERING ADD $10 FOR
SHIPPING, HANDLING, AND MEDIA COSTS
MASS. SHIPMENTS ADD 5% SALES TAX
MAKE CHECK OR MONEY ORDER PAYABLE TO

JV SOFTWARE
P.O. BOX 684•NEWTON, MA 02162

CP/M is a trademark of Digital Research, Inc.
APPLE is a trademark of Apple Computer, Inc.

Circle 128 on Reader Service card.



* Supports the 6801 microcomputer family
* Only 4x6¼" including a 4x2" prototyping area
* 2K Bytes EPROM/2K Bytes RAM/RS-232 Interface
* Complete documentation (over 50 pages)

MC6801 APPLICATIONS PROTOTYPE BOARD

The APB is a small board which supports the MC6801 family of microcomputers. It is described in Motorola's application note AN786. A typical 6801 member contains an enhanced 6800 processor, 2K bytes of ROM, 128 bytes of RAM, a 16-bit programmable timer, parallel I/O, and a serial communications interface. In addition to the resources of the 6801, the APB provides a 2K bytes EPROM (TMS2716), 2K bytes of RAM (2114L), and a full duplex RS-232 interface. It also supports special versions such as the 6801G1 with no UV erase, memory and provides on-board programming of the 68701 EPROM version.

The APB is an excellent **educational** aid which allows for evaluation and familiarization of 6801 family members. It is designed for **prototype development.** Since the 'nuts and bolts' are already in place, the designer need only add the necessary interface circuits for a particular application. It can also be used as a simple cost-effective **dedicated controller** for those limited quantity applications.

Besides being so practical, it's also fun (the board). Order yours today!

TM of Motorola Semiconductor Products Inc.

APB-1 Bare board with documentation ..... $ 19
APB-2 Above assembled with 6801 microcomputer and memory ..... $ 69
APB-3 Above with MC68701 EPROM and User's manual $109
APB-4 Above with Text 2716, 5Vdc $129

For the **SS-30** Bus:
AD-68A A/D Converter, 8 channels, 8 bits, 0-5V input, 8ms conversion time — $39 A&T
CI-68A Control Interface, 8 optoisolated inputs, 8 electrically outputs — $79 kit, $98 A&T

Terms: Check, MO, VISA, or MC. In US and Canada add $3 per item for shipping. Others add $7 per item. US funds only. TX add 5% tax. Shipped from stock to two weeks.

INNOVATIVE TECHNOLOGY
[illegible]
Garland, TX 75043 (214) 270-8393

Circle 252 on Reader Service card.



The Datasaver™ AC Power Backup fits most desktop and portable microcomputer systems. Call **Cuesta Systems, Inc.** at (805) 541-4160 for product information and application literature.

VISA/Mastercard orders.

INSTANT POWER

this publication is available in microform



University Microfilms International

300 North Zeeb Road
Dept. P.R.
Ann Arbor, MI 48106
U.S.A.

18 Bedford Row
Dept. P.R.
London, WC1R 4EJ
England



FOREIGN COMPUTER
STORES
MAGAZINE DEALERS

You have a large technical audience that speaks English and is in need of the kind of microcomputer information the Wayne Green Publications group provides.

Provide your audience with the magazine they need and make money at the same time. For details on selling **Microcomputing, 80 Micro, inCider, Hot CoCo, RUN, jr. and Wayne Green Books** contact:

Sandra Joseph
World Wide Media
386 Park Ave. South
New York, N.Y. 10016
Phone—(212) 686-1520
Telex—620430

Subscription Problem

Microcomputing does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

Please send a description of the problem and your most recent address label to:

Microcomputing
Subscription Dept.
PO Box 997
Farmingdale, NY 11737

Circle 232 on Reader Service card.

PAPER

TOP QUALITY - SHIPPED NEXT DAY
from our LA, Chicago, Newark and Atlanta warehouses

YOUR CHOICE: 26.95

1. 20 LB. SMOOTH-EDGE BOND 9½ x 11, 2500 SHEETS
2. 20 LB. STANDARD-PERF BOND 9½ x 11, 2500 SHEETS
3. 15 LB. STANDARD-PERF BOND 9½ x 11, 3200 SHEETS
4. 18 LB. STANDARD-PERF BOND 9½ x 11, 3000 SHEETS

All above are perfed both sides - snap out to 8½ x 11 sheets

5. 15 LB. HALF-INCH GREENBAR 8½ x 11, 3200 SHEETS
6. 15 LB. HALF-INCH GREENBAR 14⅞ x 11, 1500 SHEETS

For orders prepaid by check or MO, add $4.25 per carton for UPS shipping. For COD, credit card and PO orders, add $5.90 per carton for handling and UPS shipping. VISA, MC, American Express accepted. Substantial discounts on orders of six cartons or more.

CALL TOLL FREE: **(800) 628-8736**
Open M-F 7-11AM & 1-5PM PST In CA, call (213) 804-1270

A-1 COMPUTER PAPER CO.
405 E. Third #206, Long Beach CA 90802
SEND CARD OR WRITE FOR FREE SAMPLES

Shopping Around for Micros Under $10
MICROCO
WAYNE GREEN PUBLICATION
Micro Flopp
A Bum De

Make it Easy to Save Your Copies of

MICROCOMPUTING®

Your magazine library is your prime reference source— keep it handy and keep it neat with these strong library shelf boxes. They are made of white corrugated cardboard and are dust resistant. Use them to keep *all* your magazines orderly yet available for constant reference.

Self-sticking labels are available for the following:

80 Micro	*73 Magazine*	*Radio Electronics*
Microcomputing	*QST*	*Personal Computing*
inCider	*CQ*	*HOT CoCo*
Desktop Computing	*Ham Radio*	*Interface Age*

One box (BX1000) is $2.00, 2-7 boxes (BK1001) are $1.50 each, and 8 or more boxes (BK1002) are $1.25 each. Be sure to specify which labels we should send.

Call **TOLL-FREE** for credit card orders:
1-800-258-5473
Or use the order form in this magazine and mail to:

MICROCOMPUTING®

Attn: Book Sales, Peterborough, NH 03458

☐ SHIPPING AND HANDLING CHARGES $2.00 per order up to and including a quantity of eight 25¢ for each additional box ordered. ☐

Dealer..... SELL

Selling *Microcomputing* will make money for you. Consider the facts:

Fact 1: Selling *Microcomputing* increases store traffic—our dealers tell us that *Microcomputing* is one of the hottest-selling computer magazine on the newsstands.

Fact 2: There is a direct correlation between store traffic and sales—increase the number of people coming through your door and you'll increase sales.

Fact 3: Fact 1 + Fact 2 = INCREASED ALE, which means more money for you. And that's a fact.

For information on selling *Microcomputing*, call 800-343-0728 (in New Hampshire call 1-924-9471) and speak with Ginnie Boudrieau, our bulk sales manager. Or write to her at *Microcomputing*, 80 Pine St. Peterborough, N.H. 03458.

MICROCOMPUTING

80 Pine Street Peterborough, NH 03458

800-343-0728

DO YOUR HOMEWORK!

And build your own small computer while you do it. ***Kilobaud Klassroom*** teaches you the theory and gives you the hands-on training you need to learn digital electronics.

It's a complete, step-by-step course. You start with a lesson on the equipment you need and tips on how to save money by building it yourself. Then it's into the heart of the book—the in-depth study of digital electronics.

Kilobaud Klassroom is a series of experiments. For each one, you read the theory behind it, then you get to work and build the project or solve the problem you're facing. Each chapter ends with study questions to help you remember what you've learned. The projects start simple and build on each other until you wind up by building your own simple but usable microcomputer.



You can have the complete ***Kilobaud Klassroom*** course for just $14.95. Order today. You have a lot of learning to do.

Kilobaud Klassroom ISBN 0-88006-027-1
by George Young and Peter Stark 419 pp.
BK7386 softcover

To order, call toll-free 1-800-258-5473 for credit card orders, or mail coupon with payment or complete credit card information to: Wayne Green Books, Retail Sales, Peterborough, NH 03458. Include $1.50 per order for shipping and handling.

Yes! Send me _____ copies of ***Kilobaud Klassroom*** (BK7386) at $14.95 each plus $1.50 per order for shipping and handling.

☐ payment enclosed ☐ MC ☐ VISA ☐ AMEX

Card # _____ Signature _____

Expiration date _____ MC bank # _____

Name _____

Address _____

City _____ State _____ Zip _____

Wayne Green Books, Peterborough, NH 03458 **342B7K**

the schedules are being computed, Micro-Tax displays a message telling you which schedule is being processed.

When all the schedules have been computed, Micro-Tax asks if you wish to see a recap of the 1040 as it will appear or if you wish to exit to the main menu. After reviewing the 1040 for accuracy and sensible answers, you return to the main menu.

At this stage, you're ready to print the forms. You can set up a batch processing mode and run several taxpayers' forms off at once or you can print just one at a time.

The printer program is on a separate disk. After you have loaded it, you're given a chance to set up your paper and printer. You can then decide whether you wish to go to a batch mode or to print a single form.

If you have entered data all day without computing the tax forms, Micro-Tax allows you to compute all forms in the batch mode and then print them all. If you have been flat out on data entry all day, this function is useful.

Two Things . . .

Two of the things that make Micro-Tax more than just a fill-in-the-blanks program are the tax depreciation module and the decision logic built into the program that permit it to suggest the least costly ways to report your taxes.

The depreciation module is a separate program that maintains records for more than a year. As property is entered to the module, the system prompts for information about which depreciation method to use and into which class the property falls.

At the end of each tax year, modules can be updated. New balances for depreciation are computed, and, if advantageous to the taxpayer, the program automatically switches from the declining balance to the straight-line method of depreciation. This module allows you to view the depreciation information on-screen as well as in report form.

The module does not directly communicate with the tax preparation module. As a result, you'll need to enter data from the depreciation report on tax schedules requiring a depreciation entry. The report does serve as backup to the entries, however.

The Truth Hurts

To test all these claims, I forced myself, with some reluctance, to gather my tax records for 1982 and enter the data into Micro-Tax. The procedure I followed was exactly as described above. Once I got going, it wasn't too bad, but the sight of all those tax forms was a shock I really hadn't prepared myself for so early in the year. Normally, I'm one of those who waits until April 14 to sit down with my shoebox of receipts and expenses (I still haven't found time to get all my tax materials onto my PC).

Anyway, I got through the program without any problems and discovered with some regrets that I had done my taxes correctly as far as Micro-Tax is concerned. I was secretly hoping to discover I had over paid my taxes last year so I could apply for an additional refund. No such luck!

Caveats and Conclusions

If Micro-Tax did nothing more than take data from you and put it on your tax forms, it wouldn't be worth much. I can fill out my tax forms faster on a typewriter or by hand.

I recommend Micro-Tax by virtue of the fact that it has a depreciation program (which is really a database program) to keep track of depreciation over a period of years, and because it can help make decisions about what tax approaches to take to minimize your tax liability.

There are some caveats, however. Micro-Tax is not inexpensive. Neither are the overlays. The program does a lot of disk reading and writing, so it suffers a little in the speed department. Frequent use of this program can result in a lot of wear and tear on your disk drives.

Fortunately, the program is not copy protected, and it can be loaded to a fixed disk. This is probably the best way to use the program for all but the smallest of businesses. With a fixed disk, all of the tax program modules and client data is almost immediately available, speeding up the process immensely.

The documentation can be improved. I think it is appropriate to expect a program of this price to include system specific directions rather than generic instructions, which were obviously written when the only computers around ran under CP/M. In fairness, this is a pet peeve of mine, and Microcomputer Taxsystems, Inc. has seen to it that all the needed information is included.

If tax preparation is a business for you, then Micro-Tax certainly is worth exploring. The batch processing feature makes it ideally suited to processing a large number of returns.

If you wish to do just your own taxes, Micro-Tax becomes a marginal investment at best. Even Micro-Tax suggests in its literature that they specialize in programs for the tax practitioner. Company support appears to be excellent, so if you do decide to make the purchase, you probably won't be left out in the cold.

Micro-Tax is a well-supported program that can make the taxing of the republic a profitable job for you and a little less taxing.

Shawn Bryan
Montpelier, VT

How to get 99% readership for your advertising.



Each month over 150,000 active hams read **73**. Ninety-nine percent of them want to see computer ads in **73***. Hams are computer buffs too. In fact, nearly 50% of **73** readers already own or will buy a microcomputer within the next few months.

These computerists need—•New micros •Peripherals • Software

Cash in on this ready-to-buy market today. . . save money through our special combination rate program by running your ads in **73** and other Wayne Green publications.

If you want 99% readership of your ads, put them in
73: Amateur Radio's Technical Journal.
Call TOLL FREE 1-800-441-4403 or write
73 Advertising Department M, Elm Street, Peterborough, N.H. 03458.
*Based on survey taken in 1982 and 1983.

Catch the Disk O' Utilities' Fever
Speed Up WordStar with Footnote and Pair
Can Micro-Tax Make April Less Taxing?

Disk O'Utilities

System Requirements: Apple II Plus; 48Kb.
Manufacturer: Broadway Software, 642 Amsterdam Ave., Suite 136, New York, NY 10025.
Price: $12.95.

This utilities package contains a copyable disk with a baker's dozen of programs that, as a group, is a good value. While the instruction booklet is only 5½ pages long, each selection in its menu is self-prompting and easy to use and understand.

The Good, The Bad and The Marginal

As with many programs, some of Disk O'Utilities' capabilities are helpful while others are of marginal value. One of this system's best features is its ability to restore a file you just deleted. You're warned to restore before you save another file (or part of the deleted one might be covered up), but if you immediately tell the system to restore the deleted file, it will.

I tried restoring with Applesoft, Integer Basic, sequential text and binary files and it worked fine. When a file is restored, it comes back locked, evidently so you won't mistakenly erase it again. The program, however, would not restore a random-access text file for me, a limitation the booklet should warn about.

Another menu selection also has difficulty with random-access files. The system claims you can read a text file, and it will read sequential files. However, it wouldn't read any of my random-access files, and, unfortunately, the booklet doesn't mention this limitation, either.

```
**************************
*                        *
*     Copyright 1982     *
*   Broadway Software    *
*   642 Amsterdam Ave    *
*  New York City 10025   *
*                        *
**************************
```

Fig. 1. A friendly reminder on the Disk O'Utilities screen.

One of the more helpful features adds automatic line numbering, in steps of ten, to your Basic programs. It's easy to work with, to stop the process and/or to start it up again. For some reason, though, each time you list your program you're reminded about who gave you that automatic line numbering with the note in Fig. 1. This commercial message doesn't seem to effect how your programs run, though, and you only see it at the end of a listing.

Another potentially helpful part of this program is its ability to verify a disk, sector by sector. If you happen to get a disk with a bad spot, you can isolate it so your Apple disk operating system (DOS) won't save anything there.

The package can also remove DOS from your disks. A disk with its DOS removed can't boot, but this procedure does make room for more data. The system also lets you display free sectors you have on each disk when you ask for a catalog.

Have you ever inadvertently typed a control character into a program only to find it wouldn't run because of this mistake? Disk O'Utilities can display all control characters in a program listing as inverse characters so you can spot them. The system also lets you send what's on your screen to your printer, so long as it's located in slot 1 inside your Apple.

Cursing, Sorting and Converting

On the weak end of things, the Disk O'Utilities lets you change your cursor from a flashing square to whatever you'd like. You'll soon find that anything *but* what you're used to is annoying. It also can "verify your RAM," a procedure the booklet says requires about two hours.

It might be helpful to have your catalog on disk sorted alphabetically, or by file type or size. Disk O'Utilities will do it all for you. The instruction booklet doesn't warn you that the system will automatically save the new, sorted catalog on disk in place of the original.

It also doesn't mention that if you use a write-protected disk, the program claims to save the sorted catalog onto the disk and happily beeps and displays the new, "sorted" catalog that is, of course, exactly what you started with.

The system can also convert a hexadecimal number to decimal and vice versa. The package will read each track and sector off disks for you. My DOS 3.3 manual says that, "Each diskette contains 35 tracks . . . [and] . . . each track contains 16 sectors." However, when I asked the Disk O'Utilities program to read track 100, sector 100, my disk drive burbled a bit, but the system read and displayed something.

The final menu selection puts you into Basic. However, this is redundant—if you enter anything that's not on the menu, including Return, you'll find yourself in Basic.

For $12.95, even with its limitations and almost complete lack of idiot-proofing, the Disk O'Utilities is a good value. It's worth much more than its price the first time you accidentally delete your only copy of a program.

Greg Glass
Prescott, AZ

Footnote and Pair

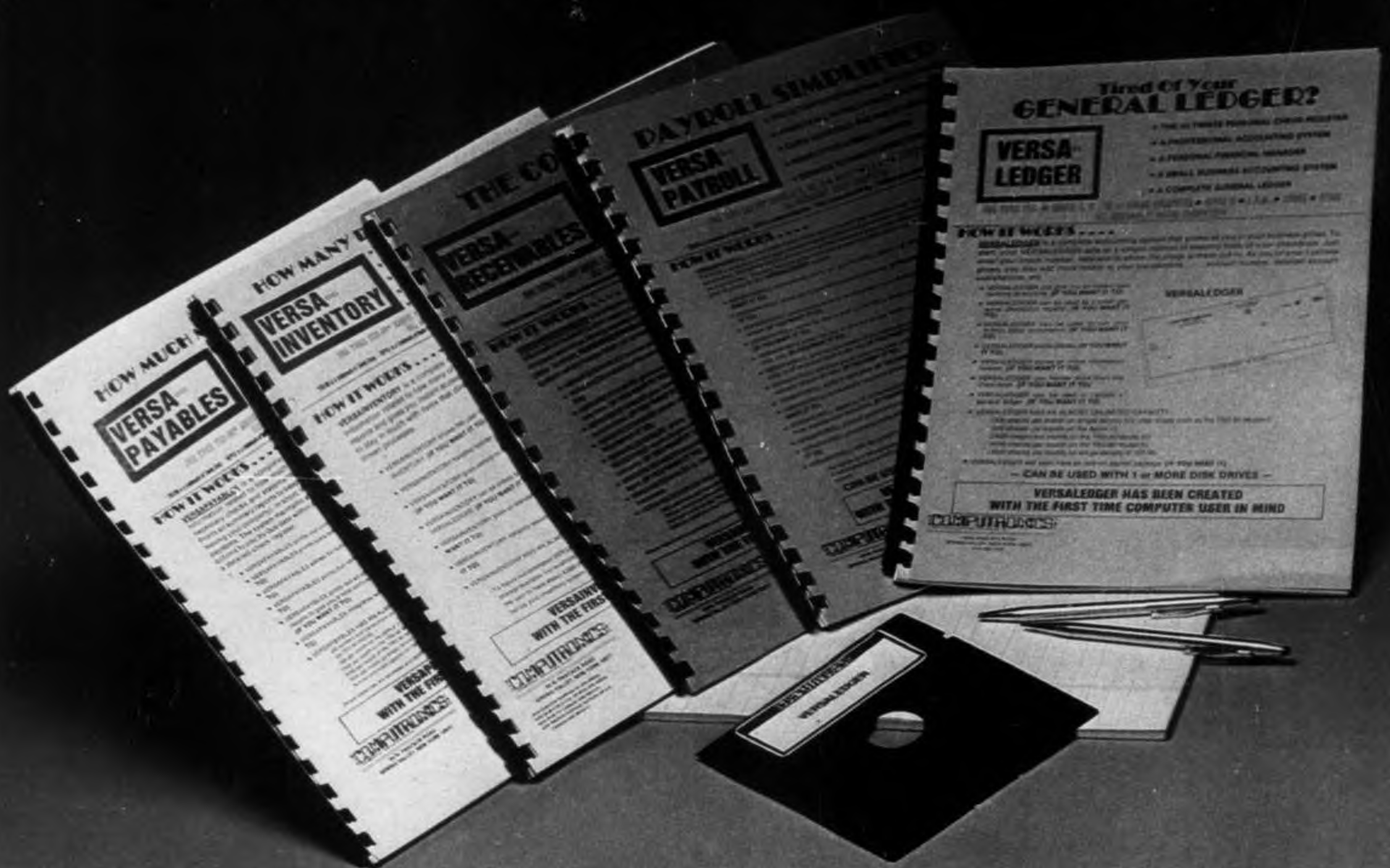
System Requirements: WordStar; CP/M 2.2 with 48Kb, or CP/M-86 or PC DOS with 64Kb.
Manufacturer: PRO/TEM Software, Inc., distributed by Digital Marketing, 2670 Cherry Lane, Walnut Creek, CA 94596.
Price: $125.

If you write technical reports, manuals, legal briefs or school term papers with WordStar (WS) or Select, you'll want Footnote and Pair to lower your frustration level and speed accurate completion

(Continued on p. 148)

Introducing the Most Powerful Business Software Ever!

TRS-80™ (Model I, II, III, or 16) • APPLE™ • IBM™ • OSBORNE™ • CP/M™ • XEROX™



The VERSABUSINESS™ Series

Each VERSABUSINESS module can be purchased and used independently, or can be linked in any combination to form a complete, coordinated business system.

VERSARECEIVABLES™ $99.95

VERSARECEIVABLES™ is a complete menu-driven accounts receivable, invoicing, and monthly statement-generating system. It keeps track of all information related to who owes you or your company money, and can provide automatic billing for past due accounts. VERSARECEIVABLES™ prints all necessary statements, invoices, and summary reports and can be linked with VERSALEDGER II™ and VERSAINVENTORY™.

VERSAPAYABLES™ $99.95

VERSAPAYABLES™ is designed to keep track of current and aged payables, keeping you in touch with all information regarding how much money your company owes, and to whom. VERSAPAYABLES™ maintains a complete record on each vendor, prints checks, check registers, vouchers, transaction reports, aged payables reports, vendor reports, and more. With VERSAPAYABLES™, you can even let your computer automatically select which vouchers are to be paid.

VERSAPAYROLL™ $99.95

VERSAPAYROLL™ is a powerful and sophisticated, but easy to use payroll system that keeps track of all government-required payroll information. Complete employee records are maintained, and all necessary payroll calculations are performed automatically, with totals displayed on screen for operator approval. A payroll can be run totally, automatically, or the operator can intervene to prevent a check from being printed, or to alter information on it. If desired, totals may be posted to the VERSALEDGER II™ system.

VERSAINVENTORY™ $99.95

VERSAINVENTORY™ is a complete inventory control system that gives you instant access to data on any item. VERSAINVENTORY™ keeps track of all information related to what items are in stock, out of stock, on backorder, etc., stores sales and pricing data, alerts you when an item falls below a preset reorder point, and allows you to enter and print invoices directly or to link with the VERSARECEIVABLES™ system. VERSAINVENTORY™ prints all needed inventory listings, reports of items below reorder point, inventory value reports, period and year-to-date sales reports, price lists, inventory checklists, etc.

VERSALEDGER II™ $149.95

VERSALEDGER II™ is a complete accounting system that grows as your business grows. VERSALEDGER II™ can be used as a simple personal checkbook register, expanded to a small business bookkeeping system or developed into a large corporate general ledger system **without any additional software.**

- VERSALEDGER II™ gives you almost unlimited storage capacity (300 to 10,000 entries per month, depending on the system),
- stores all check and general ledger information forever,
- prints tractor-feed checks,
- handles multiple checkbooks and general ledgers,
- prints 17 customized accounting reports including check registers, balance sheets, income statements, transaction reports, account listings, etc.

VERSALEDGER II™ comes with a professionally-written 160 page manual designed for first-time users. The VERSALEDGER II™ manual will help you become quickly familiar with VERSALEDGER II™, using complete sample data files supplied on diskette and more than 50 pages of sample printouts.

SATISFACTION GUARANTEED!

Every **VERSABUSINESS™** module is guaranteed to outperform all other competitive systems, and at a fraction of their cost. If you are not satisfied with any **VERSABUSINESS™** module, you may return it within 30 days for a refund. Manuals for any **VERSABUSINESS™** module may be purchased for $25 each, credited toward a later purchase of that module.

To Order:

Write or call Toll-free (800) 431-2818
(N.Y.S. residents call 914-425-1535)

- add $3 for shipping in UPS areas
- add $4 for C.O.D. or non-UPS areas
- add $5 to CANADA or MEXICO
- add proper postage elsewhere

DEALER INQUIRIES WELCOME

All prices and specifications subject to change / Delivery subject to availability.

COMPUTRONICS INC

50 N. PASCACK ROAD, SPRING VALLEY, N.Y. 10977

* TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. - *APPLE is a trademark of Apple Corp. - *IBM is a trademark of IBM Corp. - *OSBORNE is a trademark of Osborne Corp. *CP/M is a trademark of Digital Research - *XEROX is a trademark of Xerox Corp.

Circle 6 on Reader Service card.

REMEMBER.



ELEPHANT™ NEVER FORGETS.

A full line of top-quality floppies, in virtually every 5¼" and 8" model, for compatibility with virtually every computer on the market. Guaranteed to meet or exceed every industry standard, certified 100% error-free and problem-free, and to maintain its quality for at least 12 million passes (or over a lifetime of heavy-duty use).

Contact Dennison Computer Supplies, Inc., 55 Providence Highway, Norwood, MA 02062 or call toll-free 1-800-343-8413. In Massachusetts, call collect (617) 769-8150. Telex 951-624.

Dennison

Circle 355 on Reader Service card.